BIGCAT Scheduler User Guide (V3.0 – 18 Dec 2025)

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Accessing the scheduler

- The BIGCAT Scheduler can be accessed via this link: https://scheduler.bigcat.tools.atnf.csiro.au/
  - You will need to register and create an account. Use the sign-up option to sign-up for an account. Please use the same email address as you have registered in OPAL, otherwise you will not be able to share schedules for a project.

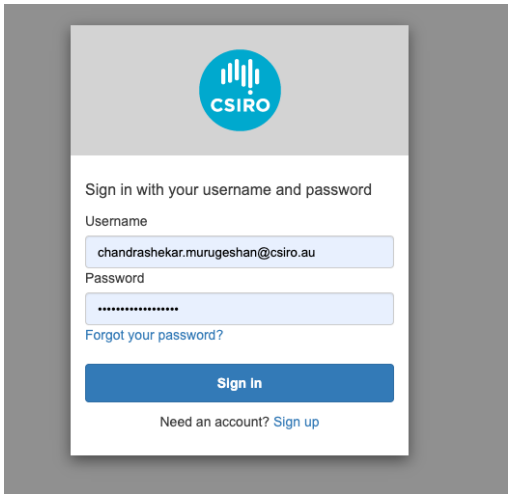

Figure 1: Logging in with your credentials

Creating a new project

- Once you login, you will be taken to the scheduler landing page, which will display options to either create a new project, open an existing project or import from a previously created project from your local machine.
- To create a new project, click on “Create Project” and give an appropriate name for the project. E.g., “HI-observations”, “Spectral-line observations”. Note that you should see directories of all projects you are a part of, plus a personal “workarea”. Select the appropriate directory for the new project to reside in.

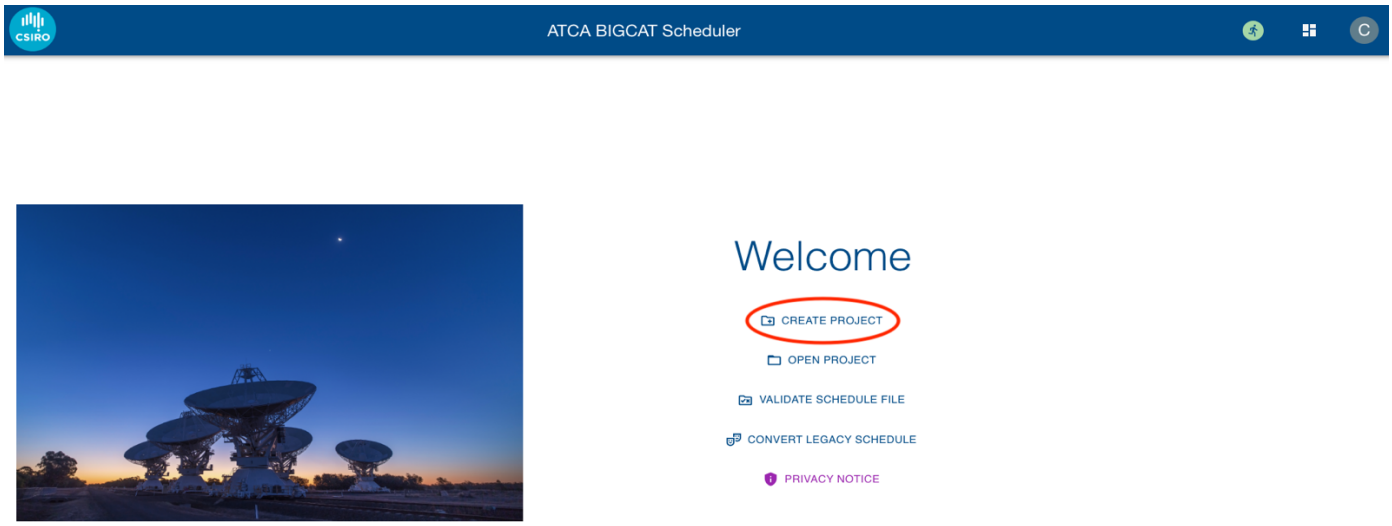

Figure 2: Landing page after logging in. You can create new projects or open existing ones.

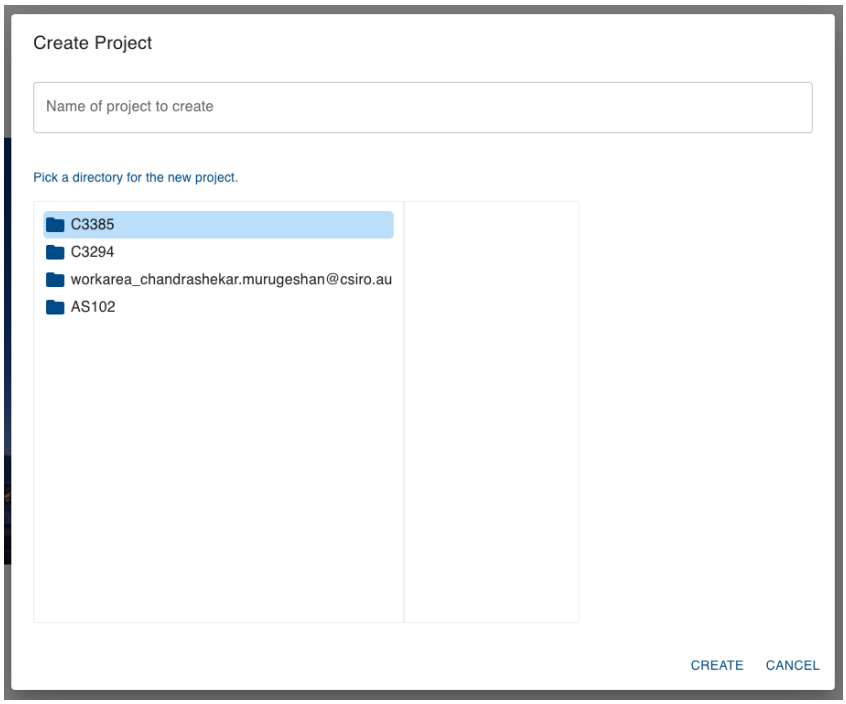

Figure 3: Name the project appropriately and select the directory where the project will reside.

Once you create a new project, you will be taken to a new project page, where you will find an empty target list. You can add your targets using the "ADD" button on the top right corner, or alternatively, you can also upload a CSV file from your local machine containing all the target sources using the format that you can find by clicking on 'SAMPLE'.

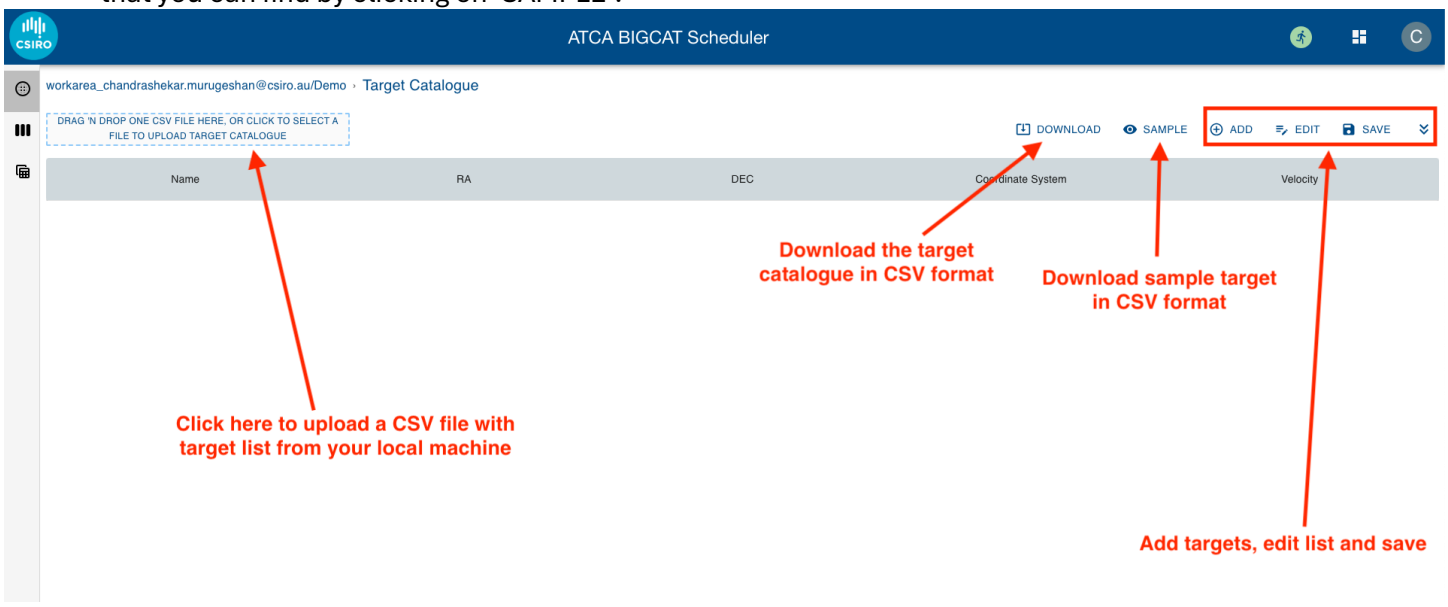

Figure 4: Layout of an empty project. One can add target sources manually or by uploading a targets list in CSV format.

- The targets CSV file consists of information about the source such as its name, RA, Dec, coordinate system used (e.g., J2000, B1950, Galactic, AzEl) and (optionally) the radial velocity of the source (in km/s) in the LSR or Barycentric frames, using the radio or optical velocity convention or the redshift of the source. Note the values need to be comma separated. An example "targets.csv" file is shown in Fig. 5.

```
# coordinate system: J2000, B1950, AzEl, Galactic
#   J2000: RA (hms) Dec (dms)
#   B1950: RA (hms) Dec (dms)
#   AzEl: Az (dms) El (dms)
#   Galactic: Long (dms) Lat (dms)
#
# velocity (optional):
# km/s Frame (lsr/barycentric) Convention (radio/optical/z)
#
# name, ra, dec, coord_sys, velocity
1934-638, 19:39:25.026, -63:42:45.630, J2000, 32.72 lsr radio
0047-579, 00:49:59.473, -57:38:27.330, J2000, 12 lsr radio
test_b1950, 00:47:48.158, -57:54:47.166, B1950
test_galactic, 303:18:47.421, -59:29:10.523, Galactic
test_az_el, 67:01:05, 45:00:00, AzEl
```

Figure 5: An example targets list file.

- Once you upload your CSV file, you will find that the project page is now populated by the target list. Note that you can "ADD" and/or "EDIT" the target list and save the progress anytime. This is shown in Fig. 6.

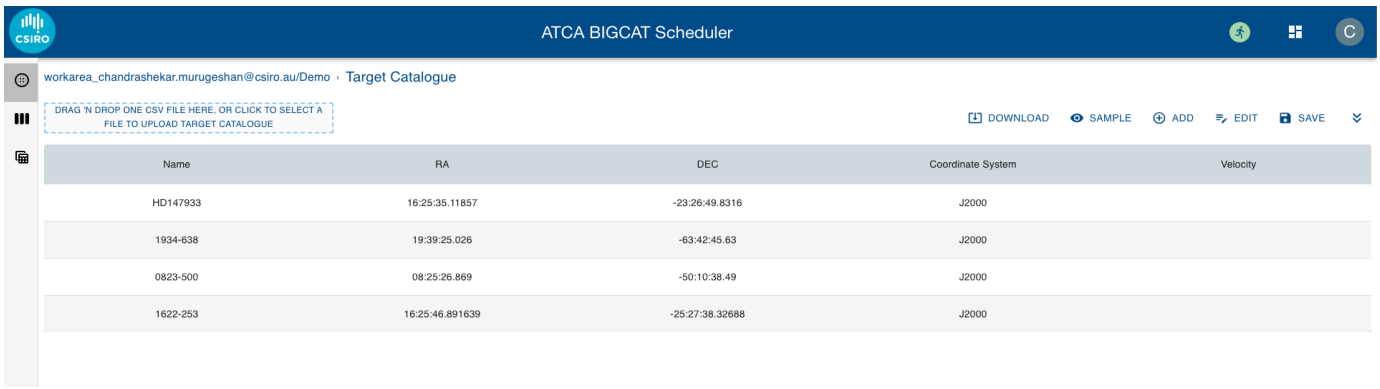

Figure 6: The project page now reflecting the populated targets list.

Choosing the correlator modes

- Next, we can add the correlator configuration we want to use for our observations. Click on the "Correlator Config" button on the top left to create new correlator modes. Note, you can create several modes and can use those when creating the schedules in the later steps. Make sure to save the configuration before moving on to create the schedule. For more information on the available frequency bands/modes, click on the question mark symbol ? See Fig. 7 below.

- The frequency bands supported:
  - 16cm: 1.0 – 3.3 GHz
  - 4cm: 4.1 – 12.3 GHz
  - 15mm: 15 – 25 GHz
  - 7mm: 30 – 50 GHz
  - 3mm: 83 – 105 GHz

  For more details on the frequency setup, please see: https://www.narrabri.atnf.csiro.au/observing/bigcat/bigcat_rf.html and https://www.narrabri.atnf.csiro.au/observing/bigcat/bigcat_rf_calculator.html
- Note that for the 7mm system, the 8 GHz IF cannot be tuned across the entire 30-50 GHz and is broken into a "LSB" and "USB" range. For the LSB, the tuning range of the ***centre*** frequency is 33840-37632 MHz and for USB the central tuning range is 44628-46158 MHz. (noting the highest/lowest frequency covered is then +-3840 MHz from this frequency). For example 40000 and 42000 MHz cannot be observed at the same time.

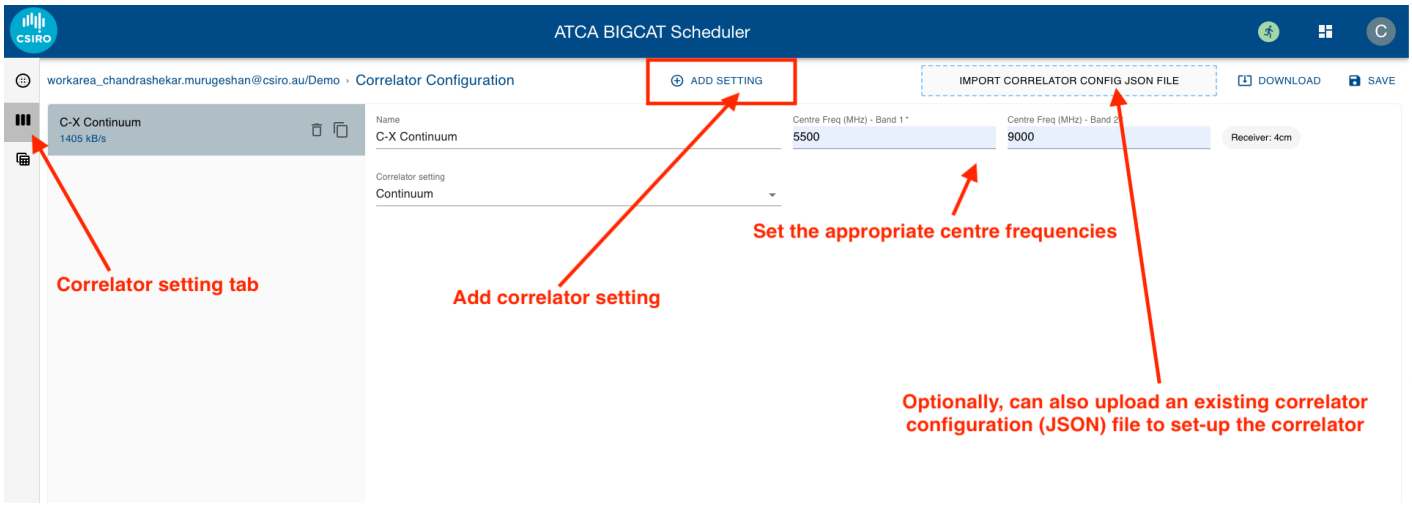

Figure 7: Setting-up the correlator configuration for the observations.

To create a new setting, click the "Add Setting" button. This will create a "blank" setting such as Fig. 8:

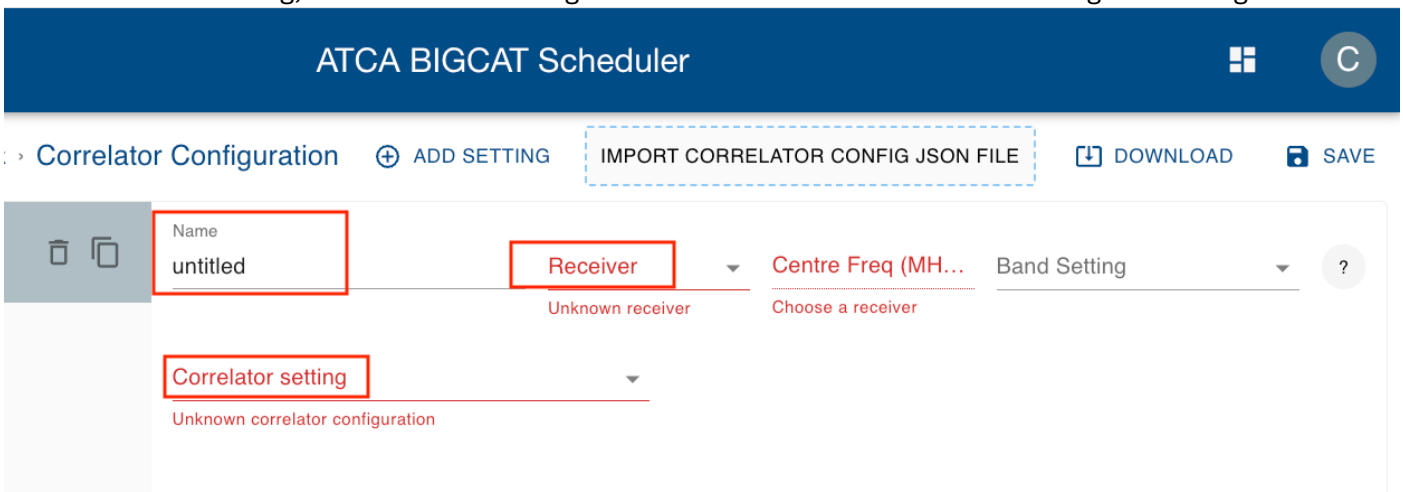

Figure 8: Blank Correlator Configuration.

- Add the setting name (anything is suitable), select the receiver and then the correlator setting (see below).
- Note that a default centre frequency will be chosen. If required, this can be changed for receivers with > 8 GHz bandwidth. For the 4cm receiver there are no tuning options and the frequency is greyed out.
- The "Band Setting" can generally be ignored and defaults to "midlow". If you wish to tune to the very edge of the receiver range, you may need to change this between the various settings. If you wish to observe the 12.2 GHz methanol maser transition, it needs to be set to "high".
- Currently, the following correlator modes are available (this may be updated in the future with more modes). Note that the total number of zooms per sub-band depends on the correlator config. There is no hard limit, but there will be GPU resource limits. Each config will be benchmarked to decide the total number of zooms per sub-band. There is also a total visibility data rate limit, so generally not every zoom will be active i.e., some sub-bands may have all zooms active, but some only 1 or 2 and the rest none.

    - "**Continuum**": Consists of 1MHz channels across the entire 128 MHz bandwidth.
    - "**Continuum + Zoom 4x2MHz_0.5kHz**": Continuum plus option of having up to 4 zooms per 128 MHz sub-band, with each zoom window having a total bandwidth of 2 MHz and a spectral resolution of 0.48 kHz.
    - "**Continuum + Zoom 4x2MHz_0.06kHz":** Continuum plus up to 4 zooms per 128MHz sub-band, with each zoom window having a total bandwidth of 2 MHz and a spectral resolution of 0.06 kHz.
    - "**Continuum + Zoom 2x8MHz 2x16MHz 15.625kHz**": Continuum plus up to 4 zoom windows per 128 MHz sub-band, with two zoom windows having a total bandwidth of 8 MHz each and the remaining two having a total bandwidth of 16 MHz each, with all four zooms having a spectral resolution of 15.625 kHz.
    - **Continuum + Zoom 1x64MHz 7.8125kHz**": Continuum plus up to 1 zoom per 128 MHz sub-band of 64 MHz having a spectral resolution of 7.8125 kHz.

- ~~“**Continuum + Zoom 1x16MHz 7.8125kHz**”: One zoom window of 16 MHz bandwidth per 128 MHz sub-band, with a spectral resolution of 7.8125 kHz~~
- “**Spectral – 74 kHz**”: 1728 Channels per 128MHz sub-band with a spectral resolution of 74 kHz.
- “**Spectral – 18.5 kHz**”: 6912 channels per 128 MHz sub-band with a spectral resolution of 18.5 kHz.
- “**Spectral – 9 kHz**”: 13824 channels per 128MHz sub-band with a spectral resolution of 9 kHz. This mode is only available for observations in the 16 cm (L) band.
- **“VLBI 1x128MHz”**: One spectral window of 128 MHz for VLBI science.
- **“VLBI 2x64MHz”**: One spectral window of 128 MHz for VLBI science.

- For correlator modes with the option of adding zooms, one can set-up the zoom windows using the “ADD ZOOM BAND” button to the right. This will add a new zoom window, and you can set the centre frequency of the zoom window.
- If you are observing a spectral line, you can use this option to search the specific line using the “OPEN VELO” tab on the top right (see Fig. 9), select your target to figure out exactly where the zoom window should be placed.

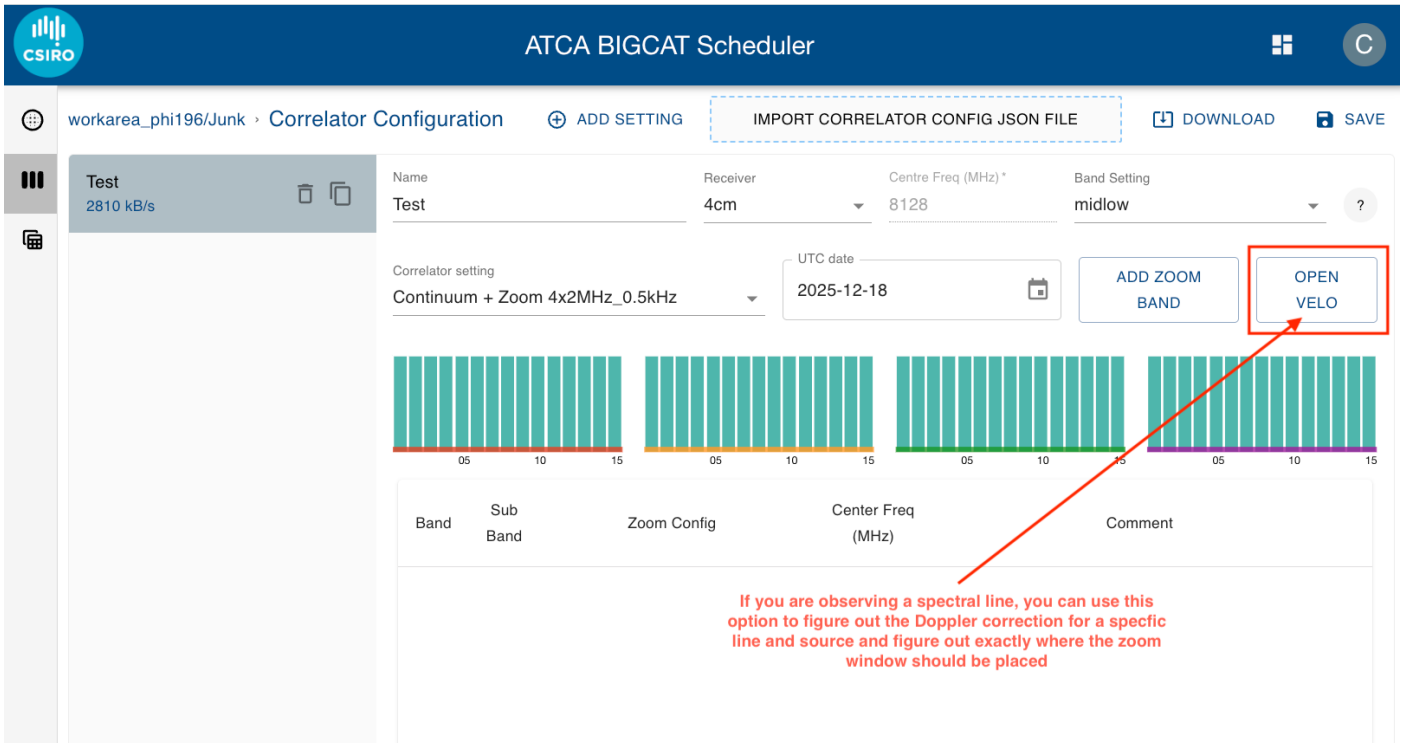

Figure 9: Adding the zoom windows and setting the appropriate centre frequencies for the zoom windows.

- Select any of your sources from the dropdown “Targets”, and select the rest frequencies of the lines you are interested in – either select from the default list, or add the rest frequency (in MHz) by hand and click “Calculate”. Any lines which are not covered by an existing zoom will be highlighted red. See Fig. 10.

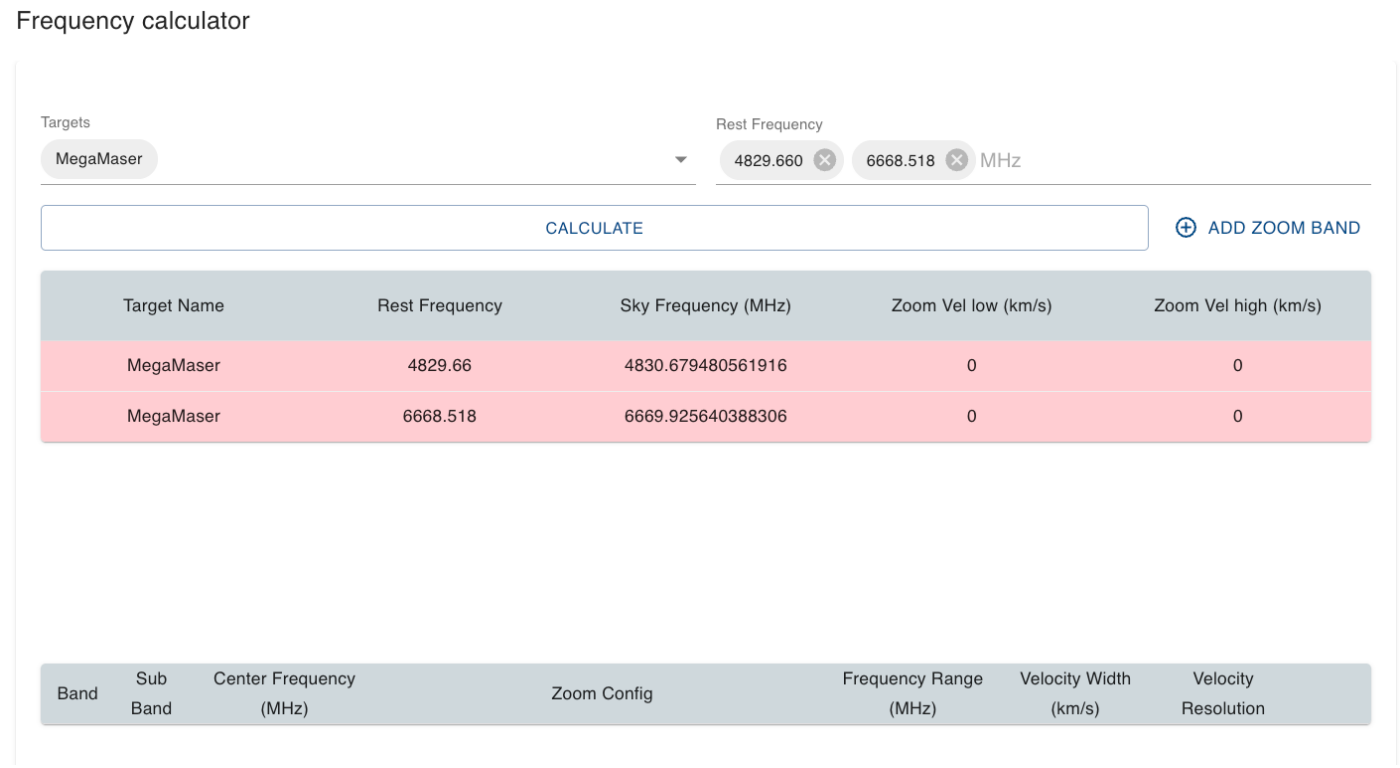

Figure 10: The velocity calculator

- If you wish to add more zoom bands, click “Add Zoom band” and set the centre frequency of the zoom and the specific zoom you are adding. For settings which have multiple zooms per subband you can always select (for example) zoom1, unless you need multiple zooms in a single subband.

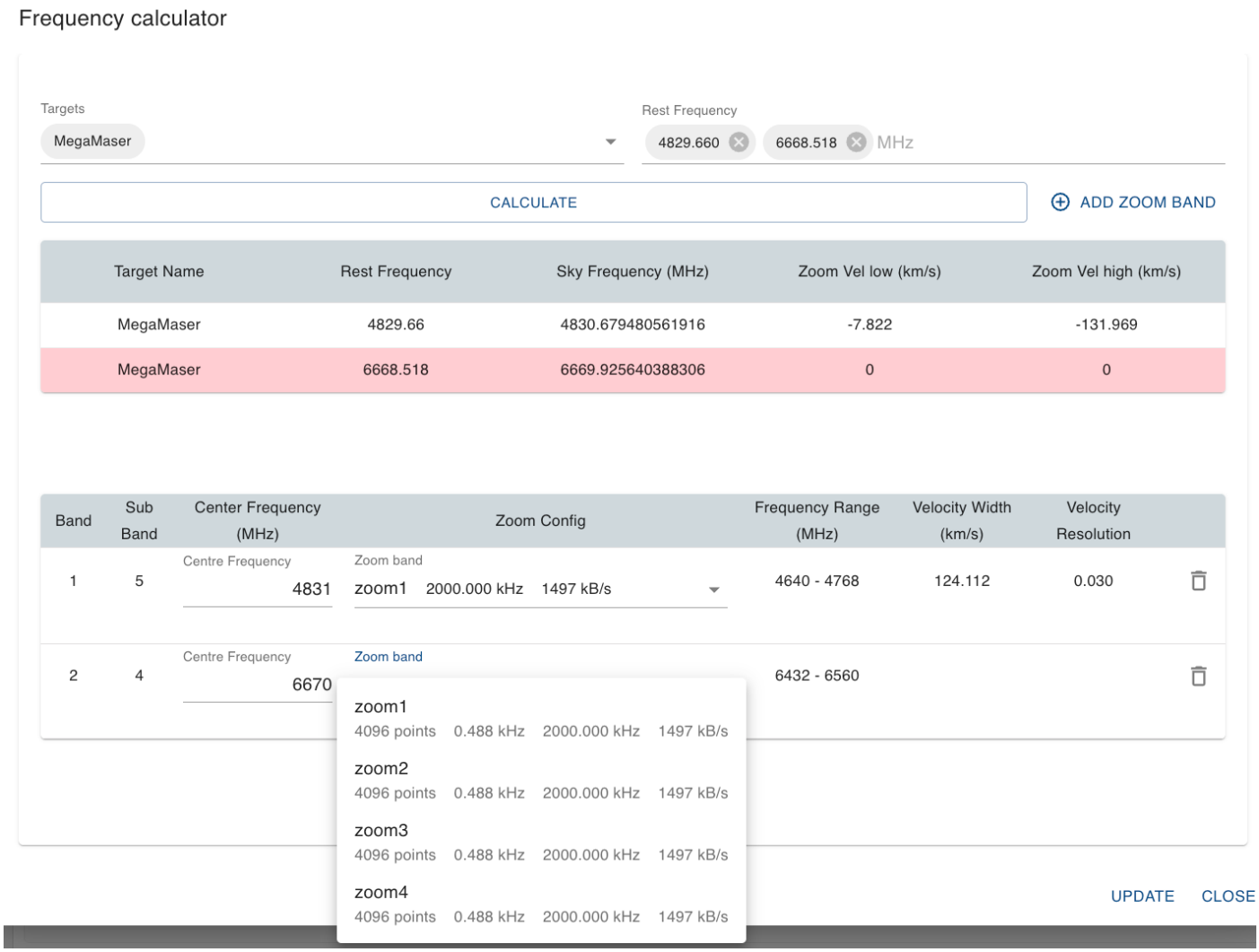

Figure 11: Adding zooms in the velocity calculator

- Once you have added the zooms you want, click “Update”.

Creating the schedule files

- Once the correlator configurations have been set-up, you are now ready to make the schedule file for your observations. Click on the schedule file button on the left and select “New Schedule File” and give it an appropriate name. Fig. 12 below shows how the scheduler page layout looks like.

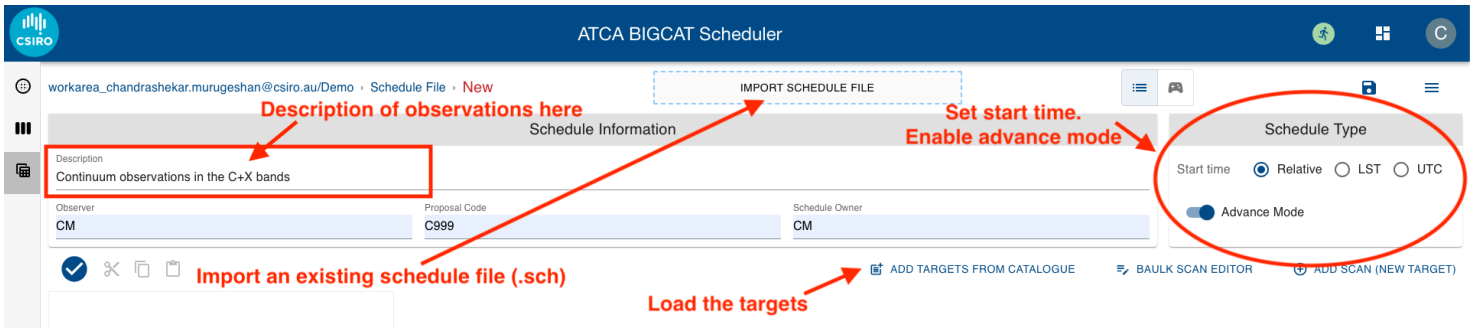

Figure 12: Creating a new schedule file.

- Enter a brief description of the observations in the “Description” field, choose the appropriate array configuration using the drop-down menu and enable the “Advanced Mode” option to give additional control over the scheduling (e.g., running commands between scans etc)
- To add targets, use the “ADD TARGETS FROM CATALOGUE” or “ADD SCAN” buttons on the right (see Fig. 13). Optionally, if you already have a schedule file (in .sch format), you can upload that to set-up the scheduler.
- One can edit each target/scan to set the duration of the scan etc. Set the “Intents” to properly reflect one of the options from the drop-down menu. The rest of the options are very similar to the existing options in CABB. For “Correlator Configuration”, choose the appropriate correlator mode you want to make the observations with. Only those options you created before in the correlator mode settings will be reflected in the options. This is shown in Fig. 14 below.

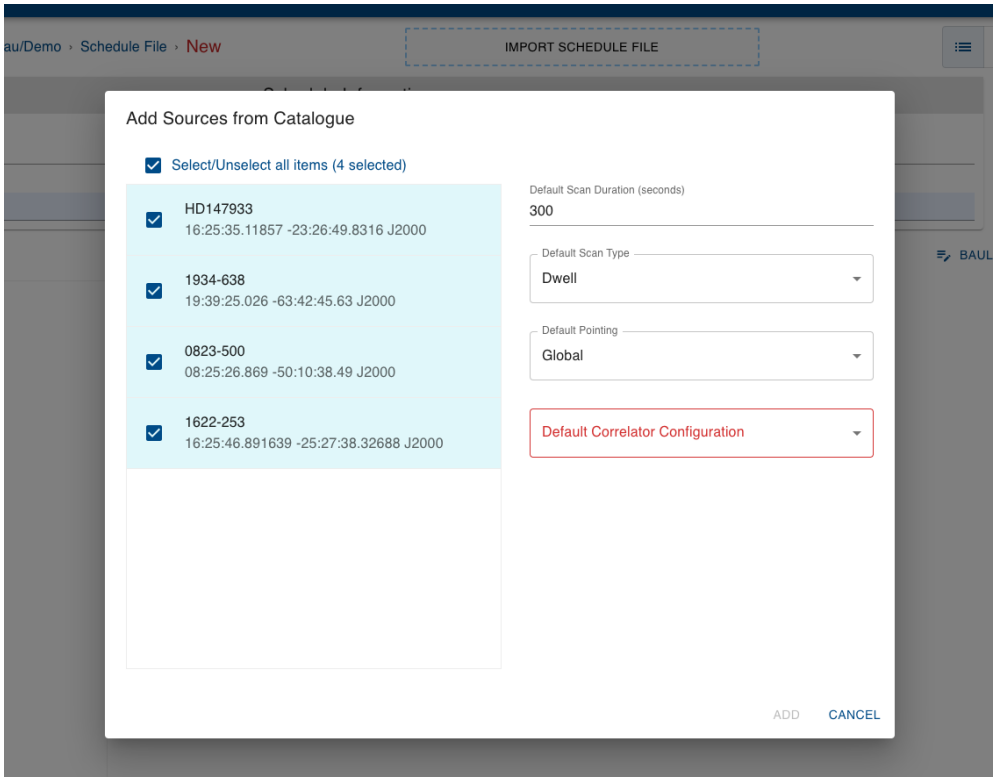

Figure 13: Adding sources from the catalogue into the schedule file.

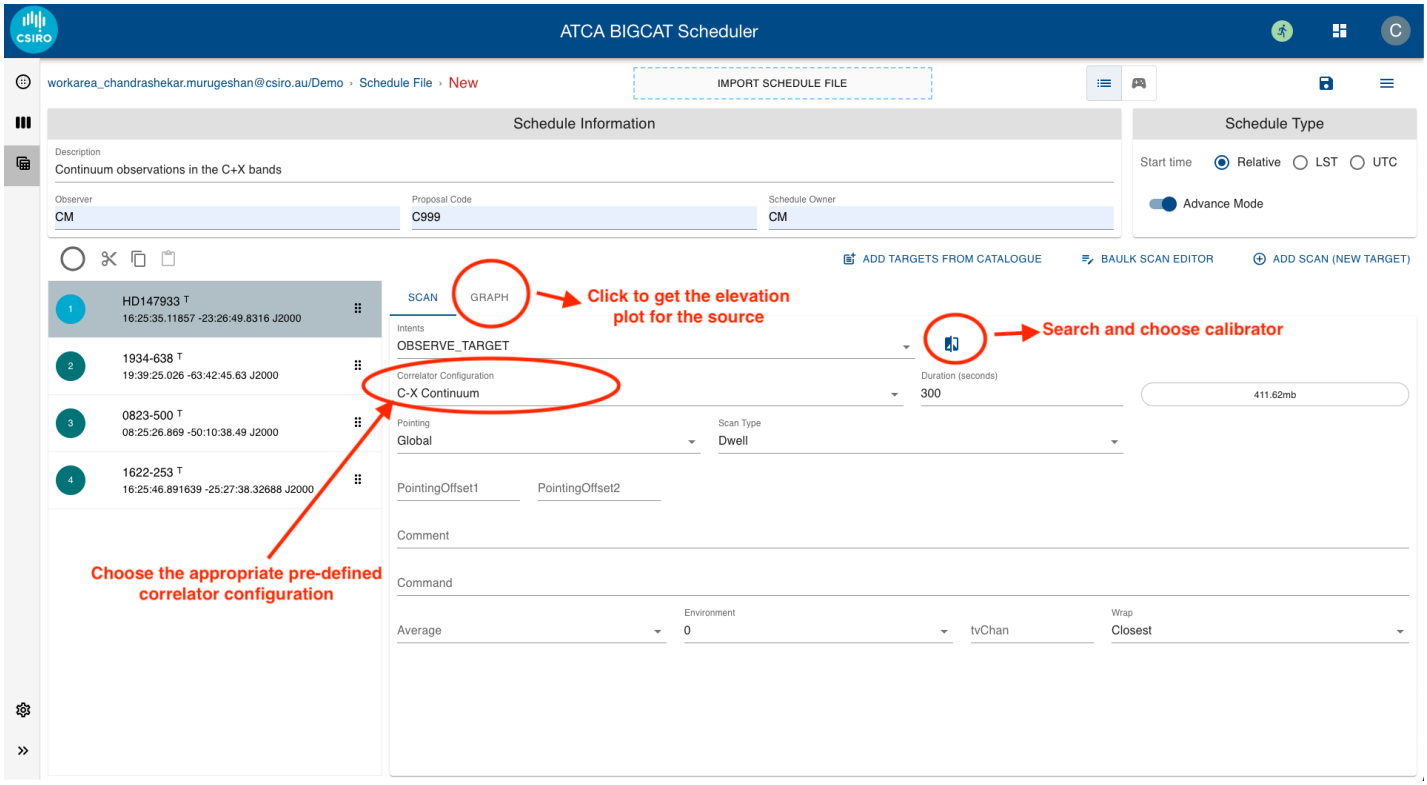

Figure 14: Once the targets have been added, we can choose appropriate calibrators and check the elevation plots for the selected sources as shown in the figure.

- To check the elevation plot for the selected source, click on “GRAPH” tab. See Fig. 14.
- To choose an appropriate calibrator, click on the calibrator icon highlighted in Fig. 14. This will open a new window, which will display all calibrators within 20 degrees of the target and display the flux in each frequency band. The frequency band selected for the current observations will be highlighted in blue. Click on the + button on the right to select a calibrator.

Figure 15: A list of calibrators for a target. The columns show the angular separation between the target and the calibrator, name, RA and Dec, and the flux densities in the various frequency bands.

- To copy/cut and paste scans/targets use the cut (scissors symbol) and paste options above the target list to perform the operations.
- Once happy with the scans, you can save the schedule file by clicking on the menu button on the top right and giving an appropriate name for the schedule file, e.g., “C+X_continuum.sch”. Note that the file needs to end with a .sch.
- You will be able to find all the saved schedule files by clicking on the “Schedule Editor” button on the left.

We are now ready to deploy (or download) the schedule file. You will find the “Deploy” option in the drop-down menu to the top right (see Fig. 16). This will open a new window (see Fig. 17) with the schedule file in the JSON format, ready to be deployed to the CAOBS server.

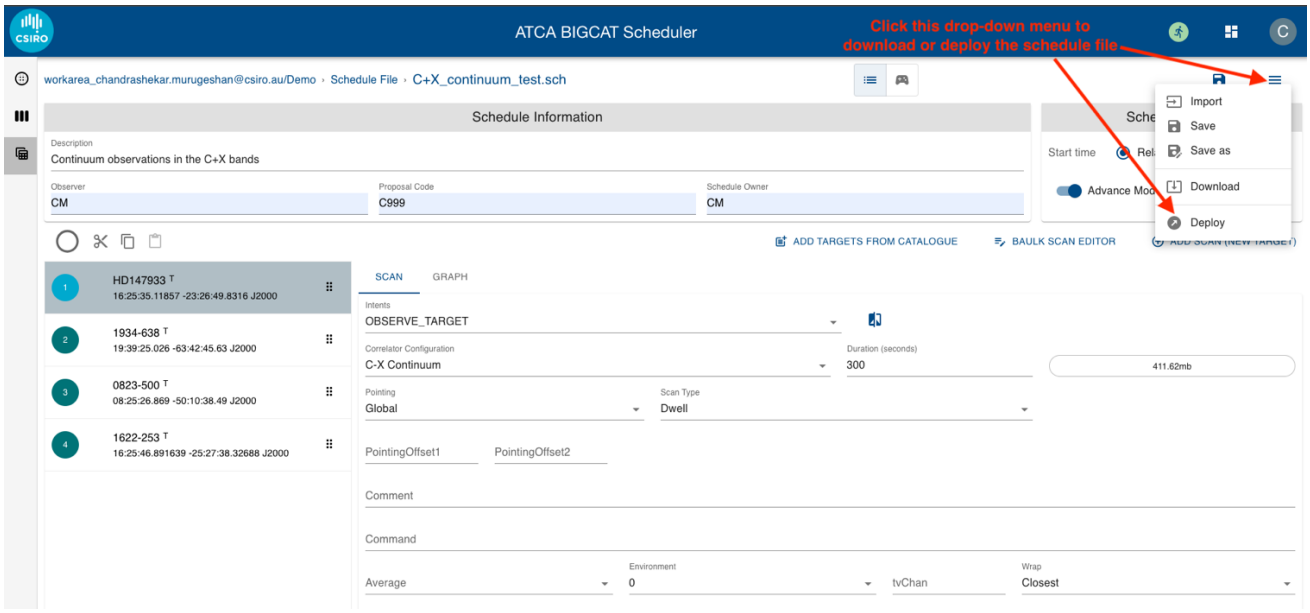

Figure 16: Deploying the schedule file.

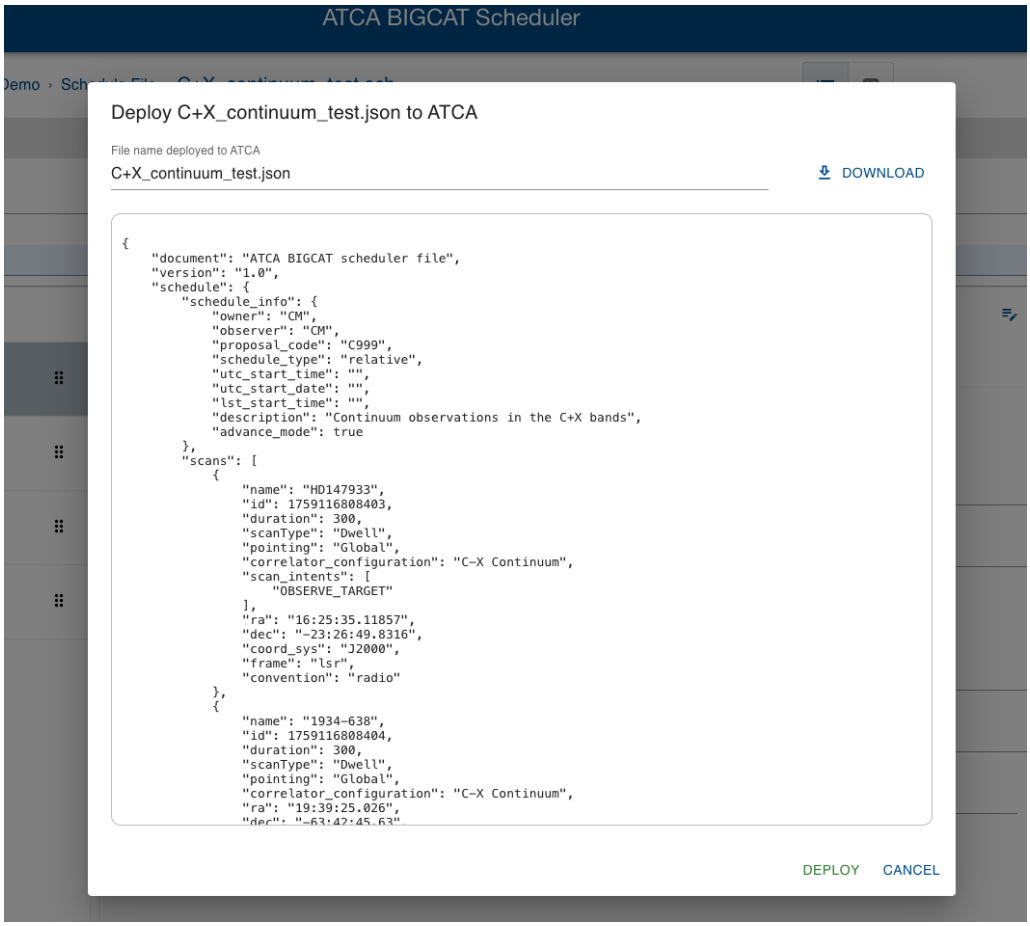

Figure 17: JSON format schedule file ready to be deployed or download for future use.