A Simple Guide to ThrUMMS Observing — 2014 Update

For ThrUMMS we don't use the TCS GUI as do most projects at Mopra. Instead, we use the robotic controller (as per MALT, eg) with a special run script for thrumms, and a file "field-list_todo" which contains the field centres we want, plus the off position and the preferred SiO pointing source for each field. If you're not familiar with the robotic script, don't worry: this guide will walk you through it.

1. In the big blue (bigrock) window, start the controller:

<atcaobs@bigrock> killtcs (Make sure all tcs processes have been stopped.)
If the cycle time is not 2.048 (eg if it's 2.000: check the MOPS GUI!), you'll have to take some extra steps. Usually steps i, ii, and iv in the below aren't necessary, but here is the full procedure: (i) Quit out of the MOPS gui, and (ii) issue a "killmops" in the relevant green (mpccc1) window. Then (iii) on bigrock,
<atcaobs@bigrock> newcain cycle 2.048 (Only if MOPS gui ≠ 2.048 !)
Then (iv) restart the MOPS gui on mpccc1. If the cycle time is already 2.048, you can skip these last 4 steps (ie, i–iv). Again, it is usually sufficient to only execute step iii here.
<atcaobs@bigrock> controller Control this with s/w/r/n/q as usual. The controller is a script which constantly polls the "queue" file and executes whatever is in there. The queue file is written to by a separate "run" script, described below. Remember! If the controller is not quit normally, you have to manually clean up the shared memory segments. Use "delmem.pl" to clean up the memory segments and "ipcs" and "ipcrm -s #shmid" to remove the semaphore.

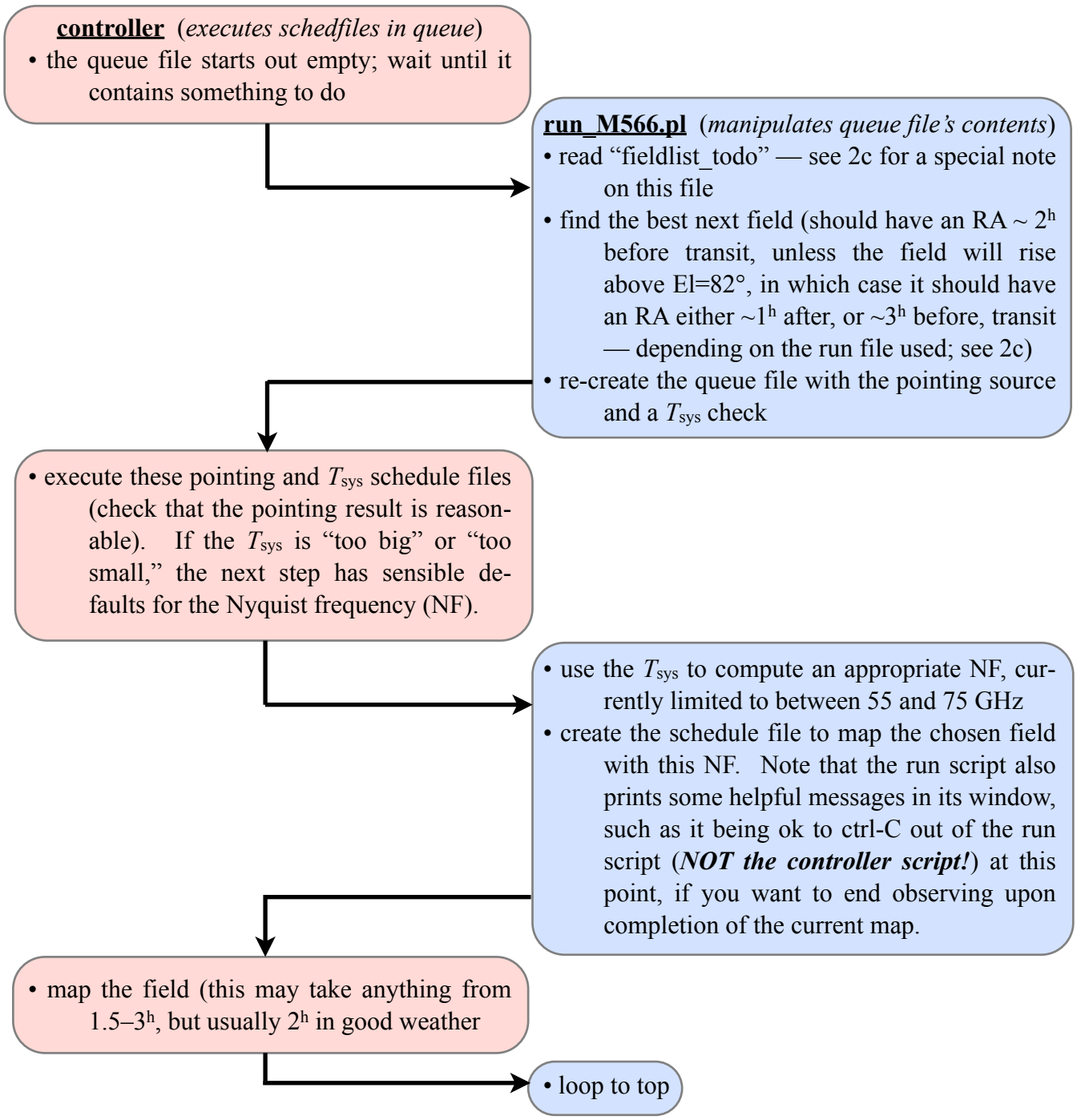
2a. In one of the little blue windows (usually situated on the bottom left of screen 1):

<atcaobs@bigrock> cd ~/qm
<atcaobs@bigrock> tail -f observer.log.M566 (To see the log traffic from the run scripts)

In the other little blue window (usually situated on the bottom right of screen 1):

<atcaobs@bigrock> cd sched_tcs/2011/M566 (Note the correct 2011/ directory, not 2010/ or any other year) If you're starting at a reasonable LST < ~13^h, then proceed as next. But if you're starting later for a short session, the elevation of R Car and BYF99a may be too low for the pointing & cal to be useful, or even feasible. In which case, skip them and go to 2c.
<atcaobs@bigrock> ./run_BYF99a_p8cal.pl This first creates a pointing schedule file for R Carinae and then a calfile on a bright nearby CHaMP source, about 90^m earlier in RA than anything thrumms-ish. Then the run script puts this info into the queue file, where the controller picks them up and actually runs them. There are other versions of this run script, "...p16cal.pl" and "...p32cal.pl", which should be used if R Car is in one of its weaker periods. In October 2011, it was very strong; in 2014 it is quite weak, and you'll need to use the p16 version at least, or maybe even p32.

After the R Car scan completes, check that the controller script has done the sensible thing with the pointing corrections. (On occasion it doesn't, and you may want to pause the next scan while you run "sio_point" in a bigrock window and forcibly accept the corrections, possibly even restarting



the script to redo the pointing. But that would be unusual. It's more critical for the calibrator than the mapping, which effectively has a bigger beam. If it's not clear what to do about the pointing from this discussion, don't worry about it. Just don't run "sio_point" in a bigrock window at the same time that the controller is trying to do the same thing! This will hang the controller and you'll have to ctrl-C out of it and clear the memory segments, etc.) Check in TOAD that the pointing corrections have been adopted.

2b. The 2nd thing that the run script has told the controller to do (after the pointing on R Car) is a calibration measurement. While the cal is running on BYF99a, remember to do a "matt au" in the MOPS GUI, and once the levels settle down, "matt ma" in the GUI again. Then in the controller, "s" and "r" for stop and resume this scan, to give us a good set of calibration spectra (visible in SPD). Also make sure the SPD spectra look ok: use "lay 2x2" in SPD since we only have 4 lines to worry about. You should see a bright ^{12}CO line, a noticeable ^{13}CO line, and the frequencies for the

other 2 windows should be correct for $C^{18}O$ and CN, 109.78 and 113.49 GHz resp., although the lines are unlikely to be visible.

On occasion, the passbands for one or more of the 4 zoom IFs will be wonky, eg they will have a sharp spike or dip in the middle, with a rollup or -down at each end. If you see such features, it is best to "s"top the current scan, and then hit the "CONFIG" button on the MOPS gui while it reloads the zoom parameters. (A temporary window, with little "o"s running around to show that the parameters are being loaded, will appear in front of the MOPS gui while this is happening; then the window should go away by itself. If they fail to load properly, the window will ask for input: either hit <return> to quit or "prog" to try again.) Then "r"estart the cal scan, and hopefully the passbands will look ok. Repeat this step as often as necessary until the passbands come out right.

2c. Once pointing is done, start mapping:
<atcaobs@bigrock> ./run_M566.pl (but see next) This starts the observe routine. It should follow the pattern shown in the flowchart (the arrows indicate how control flows between modules). SPD should look similar to the cal scan, but no spectral lines are usually visible.

2014 Updates: There are 2 new versions of this run script for this year, runlate_M566.pl and runlate_M566_weakpt.pl. They are called "runlate" because in the past, the way the fields were chosen to avoid close approaches to the zenith (where the alt-az tracking and pointing becomes problematic) tended to pick lower-longitude fields for mapping, resulting in poorer coverage across the higher longitudes. These new scripts should tend to reverse this preference over time, so that the higher longitudes (which transit at "later" times) will get mapped out more evenly. Also, the "weakpt" version explicitly uses point32 scripts for R Car and IRSV 1540, which have both become rather faint this year. So the default script in this step should be runlate_M566_weakpt.pl for 2014.

The "fieldlist_todo" file (actually this is a symbolic link — linux-speak for alias or shortcut — to the file "fieldlist_todo2014", which is the actual file you need to monitor, as explained below) is a list of all the field centres, together with their respective off positions and preferred pointing sources, remaining to do. The run script (as described in 2b above) looks at each field in this file to decide which one is optimally placed for mapping given the current LST. Once chosen, the run script also prepares the queue file with the appropriate info from this line of "fieldlist_todo", and then comments out that line from the file plus moves it into "fieldlist_done." This is in case of a wind stow or other problem, where you need to restart that map but the controller has moved on: just uncomment that line in "fieldlist_todo" with an editor, and restart the run script. Unfortunately, the run script also ***still(!)*** deletes the last line of "fieldlist_todo", no matter which map gets observed. Balt will (one day!) have a fix for this, but in the meantime, keep track of what happens to each field, so other observers know what to do with the field list the next day. Some occasional editing may still be required.

3. Keep an eye on all Mopra systems as usual, or any run/controller misbehaviours. Notify PB/BI/EM if anything seems awry. (Skype may be the best method if someone is online.) If everything is running well, it can actually get quite dull. Bring a book to read.

4. (Now deprecated.) Between an LST ~ 18^h20^m and 20^h20^m, do another cal check:

<atcaobs@bigrock> ./run_NGC6334I_cal.pl This may require stopping the appropriate run script at the end of a map, running this one, and then restarting the previous run script. The limits are because if this was done earlier, NGC 6334 would be too close to the zenith to make a reliable cal measurement, but if it were later the pointing on AH Sco (which is done ahead of the cal scan, and uses the point16 script) becomes quite difficult. When you're checking the spectra in SPD, you'll see that NGC 6334I shows all 4 spectral lines very nicely!

5a. If no other programme is following ThrUMMS (M566), then it is best to stop mapping when the elevation has dropped to no lower than 40°. Below this the airmass starts varying too quickly for our NF adjustments to keep up with the ~2^h-long maps. Try to judge this as best you can. It is more important to stop earlier (= higher up) in poor weather, or summer. It may also be reasonable to go lower than 40° in excellent weather. But probably no lower than 35° even so.

5b. If there is another programme immediately after us, then with such long maps, it is likely the last one will have to be killed on some scan. Make a note of the field name, scan number, and the total scans; for now let's record this on the observing signup GoogleDoc, at the end of the line (column L) for each day, eg 356hmh 86/142. We will finish up such maps at the end of the project, or on a specific "clean-up" day. On the other hand, if it looks like a map will be (eg) < ~¼ done (< ~30^m of map time), maybe stop early and don't bother. Or, if you can negotiate a "trade" with any follow-on project to consolidate such times into more usable blocks for us, that is even better. Be courteous, however, since some people don't like trades.

6. Remember to ctrl-C out of the ***run*** script, and quit the ***controller*** cleanly with a "q" (see step 1 if you need to ctrl-C, but again, try to avoid this). Then reset the observing system to the TCS default (most observers don't use the robotic scripts described here):

<atcaobs@bigrock> killall controller (Not always necessary, but in case there are hung perl scripts floating around)

The next 4 steps should no longer be necessary, since the default cycle time is now 2.048 sec. However if necessary for the next observer, they should be done at this point. Also, probably only the newcain step on bigrock (of the next 4 steps) is really necessary.

(Quit out of the MOPS gui)
<observer@mpccc1> killmops (To make sure)
<atcaobs@bigrock> newcain cycle 2.0 (For regular slow mapping)
<observer@mpccc1> mops (Restart the MOPS gui)

Now start the TCS gui:
<atcaobs@bigrock> tcs (For the next observer)

Check that the "~/sched_tcs/2011/M566/observer.log" symbolic link (which points to ~/qm/observer.log.M566) has all the ThrUMMS log messages. Also, please snip this session's messages (even if across UT 0000) into a new file "~/sched_tcs/2011/M566/obslog.<date>" for convenience, e.g.:

<atcaobs@bigrock> grep "Mmm dd-1" observer.log > ! obslog.2011Mmmdd and
<atcaobs@bigrock> grep "Mmm dd" observer.log >> ! obslog.2011Mmmdd

or something similar. This is not necessary, but is convenient for finding the right records!

7. Now the most fun part, at least to me! Go to the Google "live status" graphic page to edit the coloured boxes for the fields you have done today. (If the above hyperlink doesn't work, email PB for the correct url.) To edit, click on the relevant box for the field you want to colour, so that it highlights the box. Then click the "line colour" medu which should have become active, and choose the appropriate colour, as per the key on the page and what that field's status now is. Click a blank part of the graphic to have your change automatically saved.

8. If you have questions or problems and can't get hold of one of BI or PB or EM, call the DA.

Please let PB know if anything here needs more explanation!!!