How to schedule an Intensive session in VieSched++

This exercise shows how to generate a simple schedule for an intensive session. We will work on session I21099 which is a typical INT1 session between Wettzell and Kokee. In case you have further questions or troubles using VieSched++ contact *mschartner@ethz.ch*.

HINT:
Throughout this document, inputs you have to make highlighted by an orange vertical bar. Optional inputs are highlighted by a green vertical bar. Alternative ways of doing things are highlighted by a blue vertical bar. Hints and tips are highlighted by a gray vertical bar.

CHANGE OBSERVING MODE AND TARGET SNR:
The first thing you have to do is to define which observing mode should be used for this session. For real experiments, use one entry from the *"sked catalog mode"*. The INT1 sessions are typically observed with the "128-16(INT)" mode.
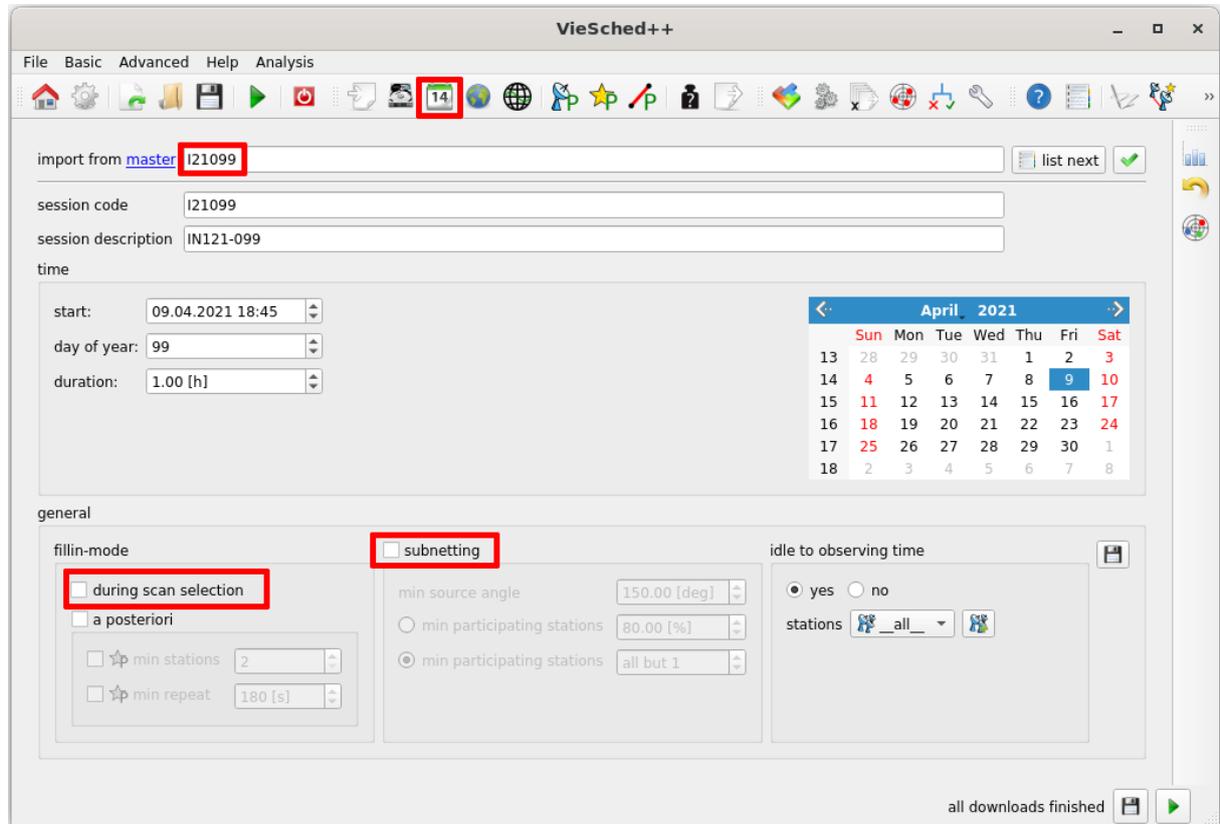Next, you can set a minimum signal to noise ratio (SNR) per observing band. We will use a SNR of 18 for X-band in this exercise.

Now, you have to define some general settings. Since we want to schedule an official IVS session, we can read the session setup from the IVS schedule master. Insert *"I21099"* next to "import from master" and hit enter to load the basic settings.

For intensive sessions, it makes no sense to allow subnetting or fillin-mode. Thus, you can deselect the options. However, it also does not hurt to keep it checked – it will simply never be used.


INTENSIVE SCHEDULING SETUP:

Next we have to define our Intensive scheduling setup. To do this efficiently, go to the "Rules" tab and click on "cat-eye optimization". On this page, you can select the "focus observations at the corners of commonly visible sky" algorithm that is designed for Intensive sessions. Every x-seconds (x = the value you select as "cadence") the algorithm will try to force an observation at the edges of the commonly visible sky. This ensures an equally distributed sky-coverage as well as good dUT1 accuracy.

Additionally, you can automatically adjust some more settings here by clicking on the buttons below.

- By clicking on "weight factors" the weight factors are adjusted for Intensive sessions
- By clicking on "min number of stations/scans" it is made sure that all stations observe together at every scan – for this two station intensive this is already always the case
- You can select a maximum scan duration below. We use 200 seconds in this exercise
- The next button adjusts the minimum time between two scans to the same source based on the cadence you have selected above ($2 \cdot cadence[sec] - 120[sec]$)
- The last button defines a standard multi-scheduling setup for intensive sessions

Instead of using these shortcut buttons it is obviously also possible to setup everything at the corresponding pages.
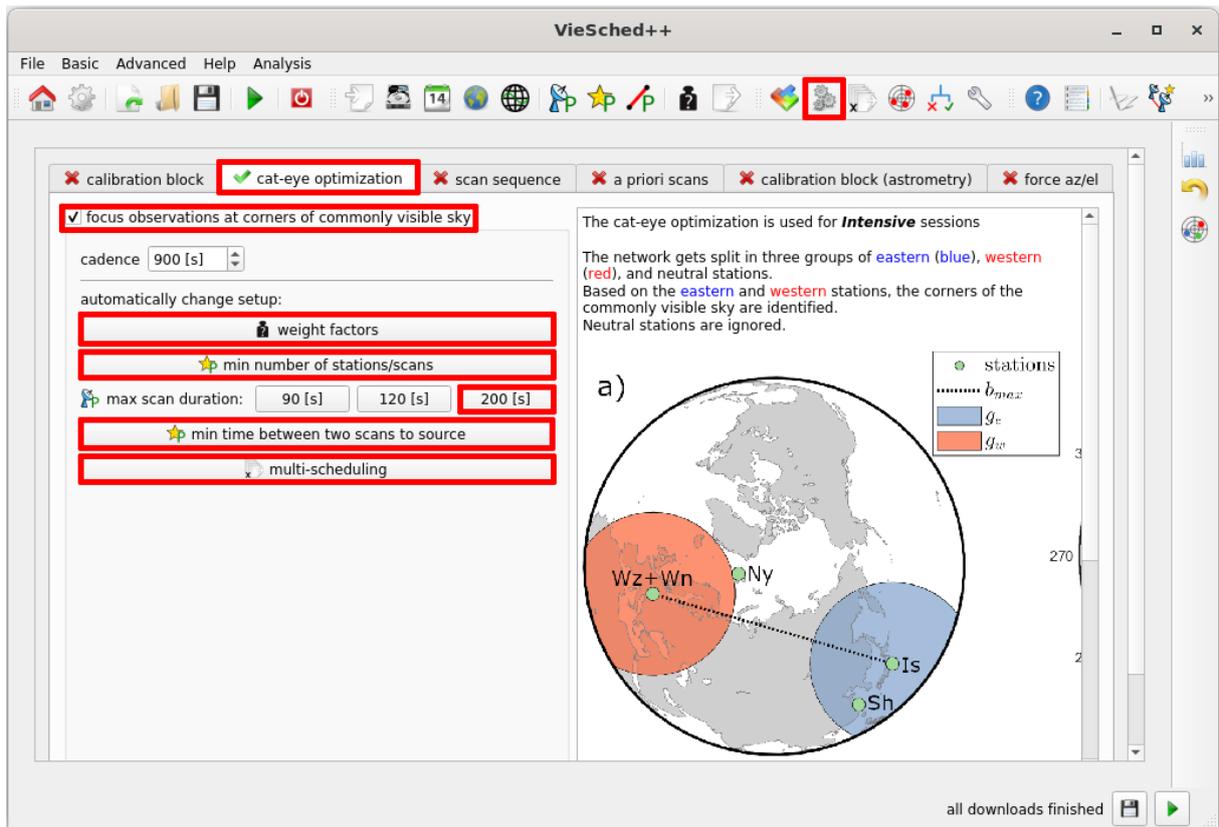
SIMULATE YOUR SESSIONS:

If you want to simulate your schedules, simply click on the "simulate schedules" checkbox. The default simulation parameters, as well as estimated parameters, should work well for a 24-hour S/X session **but not for Intensives**. You can load settings for Intensives by clicking on the load icon on the top right. There is an entry called "1h_intensive_SX" that can be used.
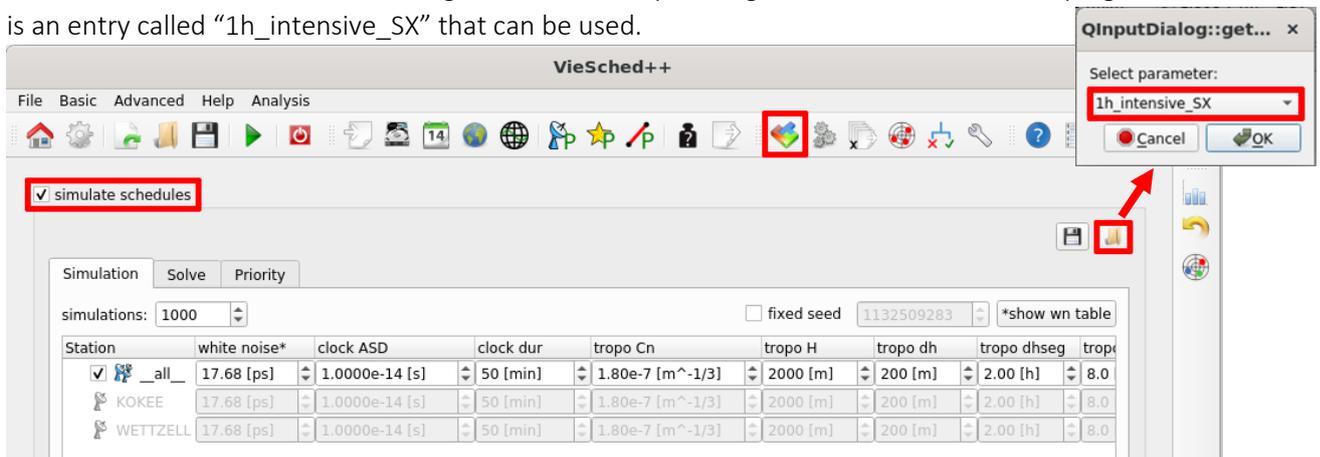
By clicking on "Solve" you can see what will be estimated. You will estimate

- one dUT1 piecewise linear offset with a very high constraint (equivalent to 1 dUT1 offset),
- one linear clock per station (except of the reference clock station) and
- one linear ZWD per station (60min piecewise linear offset with loose constraints).

If you want to adjust the estimated parameters feel free to do so.

Additionally, the "Priorities" are changed to only focus on dUT1 (weight 1) and the number of observations (weight 0.5). Since we do not estimate station coordinates their weight in the priorities does not matter.

You can start the scheduling process by clicking on the ▶ button at the bottom right of VieSched++. The log file lists the scheduling progress (check if there are any warnings or errors). If you did use the option to output a recommended schedule, VieSched++ will list it at the end of the log file (as well as some alternatives). In this example, version 8 is the most recommended.

A more general way to compare schedules is by using the statistics tool in VieSched++ 📊. To view statistics and plots of one explicit schedule, use the VieSched++ Analyzer 🎯.
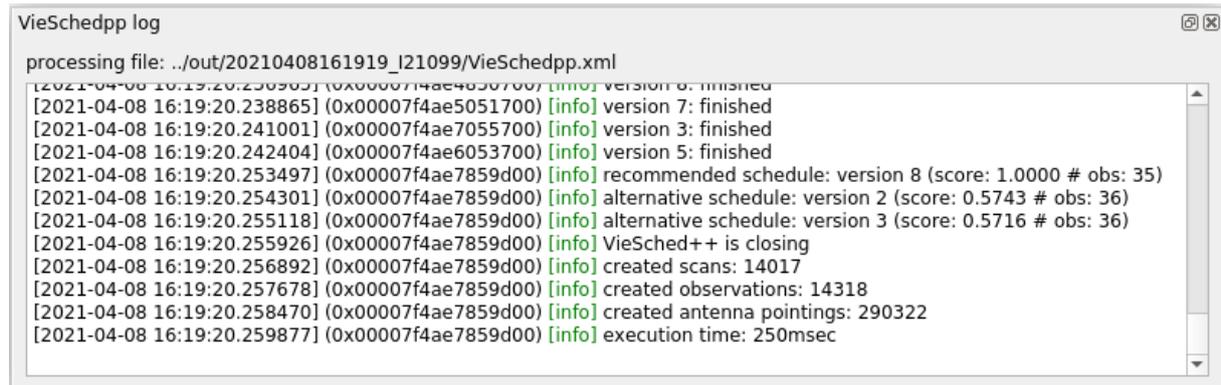
VieSchedpp log

processing file: ../out/20210408161919_I21099/VieSchedpp.xml

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[2021-04-08 16:19:20.230905] (0x00007f4ae4850700) [info] version 8: finished
[2021-04-08 16:19:20.238865] (0x00007f4ae5051700) [info] version 7: finished
[2021-04-08 16:19:20.241001] (0x00007f4ae7055700) [info] version 3: finished
[2021-04-08 16:19:20.242404] (0x00007f4ae6053700) [info] version 5: finished
[2021-04-08 16:19:20.253497] (0x00007f4ae7859d00) [info] recommended schedule: version 8 (score: 1.0000 # obs: 35)
[2021-04-08 16:19:20.254301] (0x00007f4ae7859d00) [info] alternative schedule: version 2 (score: 0.5743 # obs: 36)
[2021-04-08 16:19:20.255118] (0x00007f4ae7859d00) [info] alternative schedule: version 3 (score: 0.5716 # obs: 36)
[2021-04-08 16:19:20.255926] (0x00007f4ae7859d00) [info] VieSched++ is closing
[2021-04-08 16:19:20.256892] (0x00007f4ae7859d00) [info] created scans: 14017
[2021-04-08 16:19:20.257678] (0x00007f4ae7859d00) [info] created observations: 14318
[2021-04-08 16:19:20.258470] (0x00007f4ae7859d00) [info] created antenna pointings: 290322
[2021-04-08 16:19:20.259877] (0x00007f4ae7859d00) [info] execution time: 250msec
```

HINT:

If you regularly schedule VLBI sessions, especially for IVS, have a look at *"VieSched++ AUTO"*, a simple python program that automatically does the scheduling and uploading for you. VieSched++ AUTO is meant to run as a daily cronjob and notifies you per mail in case it did run any session (including statistics and plots that let you decide immediately if the schedule is good or not).

https://github.com/TUW-VieVS/VieSchedpp_AUTO