# How to manually schedule observations to satellites with VieSched++

This exercise is about the basics of scheduling satellite observations with VieSched++ manually. It assumes that you are familiar with how to generate AGN schedules using VieSched++. Have a look at the previous manuals to get started on this.

### HINT:

Throughout this document, inputs you have to make are 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.

# **INPUT CATALOGS:**

First, you have to select your catalog files. In addition to the standard sked-catalogs, you need to provide satellite orbits in TLE format. A common data source for TLE files is provided here<sup>1</sup>. You need to generate a new text file with the TLE information. For this tutorial, I have generated a new catalog called TLE\_Galileo.txt that will be used. This is how the content of this file looks like:

😣 🖨 🗊 🛛 Open 🕚	TLE_Galileo.txt ~/programming/VieSchedpp/CATALOGS	Save
GSAT0101 (PRN E1	1)	
1 37846U 11060A	21108.5629688100000073 00000-0 00000-0 0 9994	
2 37846 56.8078	32.9181 0004277 355.9064 4.0933 1.70475343 58972	
GSAT0102 (PRN E1	2)	
1 37847U 11060B	21107.5917526700000075 00000-0 00000-0 0 9993	
2 37847 56.8084	32.9441 0005257 332.4764 197.7070 1.70475592 58962	

The next step is to load this catalog in VieSched++:

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<sup>&</sup>lt;sup>1</sup> https://www.celestrak.com/NORAD/elements/

### **STANDARD GEODETIC SETUP:**

First, you should set up all the standard settings for your scheduling similar as done for a standard AGN- only session. This includes:

- defining a station network/start time
- selecting an observing mode
- adjusting the station-, source- and baseline-parameters
- adjusting the weight-factors
- adding calibration scans (if needed)
- defining multi-scheduling parameters
- defining simulation and analysis parameters
- etc.

Have a look at the previous manuals for more information. You can also select one of the upcoming sessions as it is done in the following.

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	AUS-MIX033	AUM033	UTAS	21.04.2021 18:00	111	18:00	(4) Hb Ke Ww Yg	UTAS	- 7
	IVS-R4995	R4995	USNO	22.04.2021 18:30	112	18:30	(11) Bd Ht Kk Mc Ns Ny Sv Wn Wz Yg Zc	WASH	4
	IVS-R1996	R1996	NASA	26.04.2021 17:00	116	17:00	(7) Ag Kk Ma Ns Ny Wn Yg	BONN	
	AOV058	AOV058	SHAO	27.04.2021 17:30	117	17:30	(8) Ho Ke Km Kv T6 Ur Ww Yg	SHAO	
	IVS-OHG130	OHG130	DACH	28.04.2021 18:00	118	18:00	(8) Ag Ho Ht Kk Oh Sy Ww Yg	BONN	4
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# **OBSERVING MODE:**

Within VieSched++, satellites are treated the same as any other source. Therefore, it is expected that you provide flux density information for satellites as well. However, in general, the flux.cat catalog does not list satellite flux information and instead, you will often simply want to observe a satellite for a fixed number of seconds.

By default, VieSched++ will not schedule sources with missing flux density information. Thus, we have to change the default settings to provide some backup flux density values. Since we are going to set the observation duration for the satellites manually, the actual backup value you set does not matter.

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### **START SATELLITE SCAN SELECTION:**

After activating the section a priori scans with a tick you can click on the button "start satellite scan selection" which opens a new window for scheduling satellite observations manually.

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# **SELECT SATELLITES:**

The new window is automatically opening the first tab  $\times$  of it. Here you have to select the satellites you want to observe and for which you therefore want to schedule scans. Simply click on the available satellites in order to add them to the list. In the following there is only one satellite selected. Here you also have the possibility to study the ground track of the selected satellites during the selected session after activating the "show track" option with a tick. By clicking on the button <sup>SO</sup> you can save the worldmap including the ground track of the satellite as a png-file.



#### **INVESTIGATE AND COMPARE SATELLITES:**

If you don't know which satellite you want to observe or which satellite is most suitable, you have the possibility to investigate the different satellites. The tab  $\mathcal{F}$  provides the elevation angle over time from the respective network for all satellites. Again, with the button  $\mathbb{F}$  you can save the different diagrams as png-files.



The tab provides the visibility of the satellites represented in different ways. The percentage of the time the different satellites are visible from a certain number of stations is in the section "Plots" represented in a bar plot, in the section "stacked plot" as a stacked bar plot and in the section "table" as a table.





# **SPECIFY CONSTANT TIMES:**

Let's go back to the first tab 3. Here you also have the possibility to define the time span for the field system time and the preob time by clicking on the button "show constant times".



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# **SATELLITE SCAN SELECTION:**

In order to get all possible scans for the selected satellites you have to press the "process" button on the bottom right. Now, all possible scans for the selected satellites are calculated and provided in the next tab  $\checkmark$ .



In order to choose and adjust a scan simply click on it and it will be shown in the lower part where you can adjust it. With clicking on the button "adjust start" the start time of the individual stations will be put on the same level, so that all stations start observing at the same time. In this case, this is not possible for the first station HART15M because its possible observation period ends before all stations are able to start observing at the same time. You can simply remove this station from this scan by removing the tick to the left of the name of the station. The observation duration for the individual station can be specified in the duration column. In the following the satellite should be observed for 30 seconds starting at 3:18:00 UT. By clicking on the button "check and save" the validity of the scan is checked (if there is any station observing alone in the beginning or end of the scan or if the scan is overlapping with another already scheduled a-priori scan). If the scan is valid and does not overlap with another scan, it is added as an a-priori scan to the schedule.

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In the following there are two more scans added to the schedule. The second scan includes all five stations and has a duration of 40 seconds starting at 4:19:42 UT and the third scan only includes three stations and starts at 7:11:01 UT with a duration of 50 seconds.

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scans s ect ter satellit scan to v v v v	elected ad MainWindo MainWindo MainWindo MainWindo MainWindo Sato203 ( Sato203 ( Sato203 ( Sato203 ( Satellite GS station HART15M KATH12M YARRA12M	just start → W PRN E26) PRN E26) PRN E26) PRN E26) AT0203 (1 21.04.20 21.04.20 21.04.20	start 21.04.20 21.07.11 20.21 21.07.11 20.21 21.07.11 20.21 21.07.11 20.21 21.07.11 20.21 21.07.11 20.21 21.07.11 20.21 21.07.11 20.21 21.07.11 20.21 21.07.11 20.21 21.07.11	21 02: 21 02: 21 07: 21 12: :01 ( :01 ( :01 (	03:53 29:03 00:38 08:36 21.0 21.0 21.0	end 21.04.2021 21.04.2021 21.04.2021 21.04.2021 04.2021 07:: 04.2021 07:: 04.2021 07:	06:44: 06:54: 17:30: 1:51 1:51	45 59 24 00	duration 16852 15956 5506 19284 duration 50 50 50	stat FF FF	ion(s) Ht Hb Ho Ke Y Ht Hb Ho Ke Y Hb Ho Ke Yg	Yg Yg	✓ check and

# **SCAN OVERVIEW:**

The next tab provides you an overview over the a-priori scheduled satellite scans. Here you have the possibility to remove any of the scans by simply choosing the respective scan and clicking the "remove" button on the bottom right.

eneral information								со	nstant times	
session start time session end time list of stations	4/21/21 5 4/21/21 5 4/21/21 5 HOB. HOB. KATH YARF	:30 PM :30 PM T15M ART12 ART26 H12M RA12M							ield system preob	6
elected scans satellite	(PRN E26)	start 21.04.2021	03:18:43	end 21.04.2021 0	)3:19:29	duration 46	station(s) <sup>38</sup> Hb Ho K	Ke Yg		
<ul> <li>X GSAT0203</li> <li>X GSAT0203</li> </ul>	(PRN E26) (PRN E26)	21.04.2021 21.04.2021	03:18:43 04:19:26	21.04.2021 0 21.04.2021 0	)3:19:29 )4:20:22	46 56	Hb Ho K	(e Yg lo Ke Y	g	

### **SCAN SPECIFIC VISUALIZATION:**

The next tab I provides you a scan specific visualization of the selected scans. On the left there is a skyplot with azimuth and elevation angels of all stations. With the dropdown menu it is possible to have a look on the skyplot from a single station together with its horizon mask. On the right there are the elevation angels over time shown and the elevation angels during the scheduled satellite scan are highlighted with bold black lines. Again, with the Solutions it is possible to save the respective graphic as a png-file.



### **FIX SATELLITE SCANS TO THE SCHEDULE:**

When you finish the satellite scan selection you can add the scans to the schedule by clicking on the button in the navigation bar. Now, the three selected satellite scans are added as fixed scans to the schedule. The remaining part of the schedule will be filled with observations to quasars using the recursive scan selection of VieSched++. If you have set all settings for the quasar observations you can simply click on the button in order to start the generation of the schedule.



### **OUTPUT:**

VieSched++ is now generating a schedule for the specified time span with the selected network including the manually scheduled satellite scans. Let's have a look on the \*\_iteration\_\*.txt file. In this file the a-priori scans are listed in the beginning.

available s GSAT0203	atellites (PRN E26)	s: (1) )							
a priori scan   source: GSAT0	(id: 203 (PRN	0) E26) (id	d: 336)					duration: ( type: target	03:18:59 - 03:19:29 single source scan
station	delay   [s]	slew [s]	idle   [s]	preob [s]	obs [s]	duration start - end	az [deg] start - end	unaz [deg] start - end	el [deg] start - end
HOBART12 HOBART26 KATH12M YARRA12M	6 6 6 6	0 0 0 0	0 0 0	10 10 10 10	30 30 30 30	03:18:59 - 03:19:29 03:18:59 - 03:19:29 03:18:59 - 03:19:29 03:18:59 - 03:19:29 03:18:59 - 03:19:29	220.7016 - 220.8134 220.7000 - 220.8118 215.0042 - 215.0311 219.2944 - 219.3140	220.7016 - 220.8134 220.7000 - 220.8118 215.0042 - 215.0311 219.2944 - 219.3140	20.3249 - 20.4425 20.3220 - 20.4396 5.2279 - 5.3726 27.6562 - 27.8158
a priori scan source: GSAT0	(id: 203 (PRN	1) E26) (id	d: 336)					duration: type: target	04:19:42 - 04:20:22 single source scan
station	delay   [s]	slew [s]	idle [s]	preob [s]	obs [s]	duration start - end	az [deg] start - end	unaz [deg] start - end	el [deg] start - end
HART15M HOBART12 HOBART26 KATH12M YARRA12M	6 6 6 6	0 0 0 0	0 0 0 0	10 10 10 10	40 40 40 40 40	04:19:42 - 04:20:22 04:19:42 - 04:20:22 04:19:42 - 04:20:22 04:19:42 - 04:20:22 04:19:42 - 04:20:22 04:19:42 - 04:20:22	130.6836 - 130.4033 240.1468 - 240.4131 240.1445 - 240.4131 240.1445 - 240.4107 224.0083 - 224.1768 230.3120 - 230.5564	130.6836 - 130.4033 240.1468 - 240.4131 240.1445 - 240.4107 224.0083 - 224.1768 230.3120 - 230.5564	37.1747 - 37.0893 29.6206 - 29.6530 29.6177 - 29.6501 21.8993 - 22.0615 46.2069 - 46.3834
a priori scan source: GSAT0	(id: 203 (PRN	2) E26) (id	d: 336)					duration: ( type: target	07:11:01 - 07:11:51 single source scan
station	delay   [s]	slew [s]	idle [s]	preob [s]	obs [s]	duration   start - end	az [deg]   start - end	unaz [deg]   start - end	el [deg] start - end
HART15M KATH12M YARRA12M	6 6 6	0 0 0	0 0 0	10 10 10	50 50 50	07:11:01 - 07:11:51 07:11:01 - 07:11:51 07:11:01 - 07:11:51	62.7393 - 62.4734 295.4019 - 295.7194 317.9045 - 318.1251	62.7393 - 62.4734 295.4019 - 295.7194 317.9045 - 318.1251	12.1318 - 11.9574 23.8953 - 23.7444 28.2648 - 27.9985

Further, it can be seen that VieSched++ started a scan selection from 17:30:00 – 3:18:43 which is from the beginning of the session until the first satellite scan. During this time, the schedule is filled with scans to quasars.

	start scan	selection:	2021.04.20 17:30:00	- 2021.04.21 03:18:43	( 9.81 h)	
depth: 0 scan: no0003 (id: 41) source: 1334-127 (id: 184)					consider duration: 1 type: target	red single scans 44 17:30:00 - 17:30:30 single source scan
HART15M   0   HOBART12   0   HOBART26   0   KATH12M   0   YARRA12M   0	0     1     0     1     0       0     1     0     1     0       0     1     0     1     0       0     1     0     1     0       0     1     0     1     0	30     30     30     30     30	17:30:00 - 17:30:30   17:30:00 - 17:30:30   17:30:00 - 17:30:30   17:30:00 - 17:30:30   17:30:00 - 17:30:30	91.7431 - 91.6901   285.6047 - 285.5024   285.6015 - 285.4992   267.1074 - 267.0842   303.1900 - 303.0070	91.7431 - 91.6901   285.6047 - 285.5024   285.6015 - 285.4992   267.1074 - 267.0842   303.1900 - 303.0070	27.5262 - 27.6389 34.8268 - 34.7382 34.8257 - 34.7371 52.1629 - 52.0417 63.9519 - 63.8602
depth: 0 scan: no0004 (id: 146) source: 1144-379 (id: 161)					consider duration: 1 type: target	red single scans 42 17:32:56 - 17:33:58 single source scan
HART15M   6   HOBART12   6   HOBART26   6   1 KATH12M   6   YARRA12M   6	38     92     10       19     111     10       30     0     10       30     100     10       24     106     10	43 62 30 62 53	17:32:56 - 17:33:39   17:32:56 - 17:33:58   17:32:56 - 17:33:26   17:32:56 - 17:33:58   17:32:56 - 17:33:58   17:32:56 - 17:33:49	121.0297 - 121.0775   243.5616 - 243.4338   243.5595 - 243.4976   234.0199 - 234.0288   243.6480 - 243.6338	121.0297 - 121.0775   243.5616 - 243.4338   243.5595 - 243.4976   234.0199 - 234.0288   243.6480 - 243.6338	56.4900 - 56.6285 29.6576 - 29.4875 29.6552 - 29.5728 26.5015 - 26.2984 47.4451 - 47.2716
depth: 0 scan: no0005 (id: 295) source: 1424-418 (id: 201)					consider duration: 1 type: target	red single scans 39 17:35:07 - 17:38:11 single source scan
station   delay   sl   [s]   [s	ew   idle   preob ]   [s]   [s]	obs     [s]	duration start - end	az [deg]   start - end	unaz [deg] start - end	el [deg] start - end
HART15M 6 HOBART12 6 HOBART12 6 HOBART26 6 KATH12M 6 KATH12M 6 KATH12M 6 HOBART26 FOR CONTRACT CONTRAC	40     32     10       34     19     10       85     0     10       31     22     10       32     30     10	184 162 52 184	17:35:07 - 17:38:11   17:35:07 - 17:37:49   17:35:07 - 17:35:59   17:35:07 - 17:38:11   17:35:07 - 17:38:11	126.3397 - 126.2099   256.1720 - 255.9072   256.1679 - 256.0829   215.1603 - 215.7789   210.2366 - 211.9828	126.3397 - 126.2099 256.1720 - 255.9072 256.1679 - 256.0829 215.1603 - 215.7789 210.7366 - 211.9828	26.4270 - 26.9846 58.7021 - 58.2202 58.6999 - 58.5452 53.3737 - 52.9415 74.2057 - 73.9395
atellite scan. This p	rocess is con	tinued u	intil the end of	the session, as it	can be seen in th	he following.
atellite scan. This p	rocess is con	tinued u	intil the end of	the session, as it	can be seen in the	he following.
atellite scan. This p	rocess is con	tinued u	a priori sc	the session, as it	can be seen in the duration:	ne following.
atellite scan. This p a priori scan (id: 0) source: GSAT0203 (PRN E26 station   delay   s'   [s]   [:]	rocess is con (id: 336) (id: 410   preo [ew   idle   preo ]   [s]   [s]	tinued u	a priori sc duration start - end	atenite scan unu the session, as it an   az [deg]   start - end	duration: duration: type: target unaz [deg] start - end	ne following. 03:18:59 - 03:19:29 t single source scan   el [deg] start - end
atellite scan. This p a priori scan (id: 0) source: GSAT0203 (PRN E26 station   delay   s   [s]   [: HOBART12 6 HOBART26 6 KATH12M 6 YARRA12M 6	rocess is con (id: 336) (id: 336) (id: [s]	b   obs     [s]   [s]   30   0   30   0   30	duration start - end 03:18:59 - 03:19:29 03:18:59 - 03:19:29 03:18:59 - 03:19:29 03:18:59 - 03:19:29	an   az [deg]   start - end   220.7016 - 220.8134   225.7060 - 220.8131   215.004 - 215.0311   219.2944 - 219.3140	duration: type: target unaz [deg] start - end 220.7016 - 220.8134 225.0700 - 220.8134 215.0902 - 215.0311 219.2944 - 219.3140	et [deg] start - end 20.3249 - 20.4425 20.3220 - 20.4396 5.5279 - 5.3726 27.6562 - 27.8158
atellite scan. This p a priori scan (id: 0) source: GSAT0203 (PRN E26 station   delay   s   [s]   [: HOBART12 6 HOBART26 6 KATH12M 6 YARRA12M 6	rocess is con (id: 336) (id: 336) (id: [s] [s] [s] [s] 0 0 1 1 0 0 1 1	b   obs     [s]   [s] 0   30   0   30   0   30   selection:	duration start - end 03:18:59 - 03:19:29 03:18:59 - 03:19:29 03:18:59 - 03:19:29 03:18:59 - 03:19:29 03:18:59 - 03:19:29	an   az [deg]   start - end   220.7016 - 220.8134   220.7000 - 220.8138   215.004 - 215.0318   219.2944 - 219.3140 9 - 2021.04.21 04:19:2	duration: type: target unaz [deg] start - end 220.7016 - 220.8134 2250.7000 - 220.8134 215.0042 - 215.0311 219.2944 - 219.3140	et following. 03:18:59 - 03:19:29 t stngle source scan et [deg] start - end 20.3249 - 20.4425 20.3220 - 20.4396 5.2279 - 5.3726 27.6562 - 27.8158
atellite scan. This p a priori scan (id: 0) source: GSAT0203 (PRN E26 station   delay   s' [s] [: HOBART12   6 HOBART26   6 KATH12M   6 YARRA12M   6 VARRA12M   6 depth: 0 scan: no0147 (id: 179; source: 1057-797 (id: 149)	rocess is con (id: 336) (id: 336) (id: [s] [s] 0 0 1 1 0 0 1 1 0 0 1 1 start scan	b   obs     [s]     [s]   0   30   0   30   0   30   selection:	duration start - end 03:18:59 - 03:19:29 03:18:59 - 03:19:29 03:18:59 - 03:19:29 03:18:59 - 03:19:29 03:18:59 - 03:19:29 2021.04.21 03:19:2	are scan until the session, as it an   az [deg]   start - end   220.7016 - 220.8134   220.7000 - 220.8134   225.0042 - 215.0311   219.2944 - 219.3140 9 - 2021.04.21 04:19:20	duration: type: target unaz [deg] start - end 220.7016 - 220.8134 220.7000 - 220.8134 220.7000 - 220.8134 220.7000 - 220.8134 219.2944 - 219.3140 6 ( 1.00 h) constde duration: type: target	03:118:59 - 03:19:29 03:18:59 - 03:19:29 single source scan el [deg] start - end 20.3249 - 20.4425 20.3220 - 20.4396 5.2279 - 5.3726 27.6562 - 27.8158 erred single scans 44 03:21:35 - 03:28:52 t single source scan
atellite scan. This p a priori scan (id: 0) source: GSAT0203 (PRN E26 station   delay   s [s] [i HOBART12   6 HOBART26   6 KATH12M   6 YARRA12M   6 HOBART12   6 HOBART12   6 HOBART12   6 HOBART12   6 HOBART26   6 KATH12M   6 KAT	rocess is con (id: 336) (id: 33	b   obs     [5]   [5]   [5]   -	duration start - end 03:18:59 - 03:19:29 03:18:59 - 03:28:19:29 03:21:35 - 03:28:18 03:21:35 - 03:28:52 03:21:35 - 03:28:52 03:21:35 - 03:28:52	an an an an 220.7016 - 220.8134 220.7016 - 220.8134 220.7000 - 220.8118 215.0042 - 215.0311 219.2944 - 219.3140 9 - 2021.04.21 04:19:20 188.8009 - 188.6169 168.9799 - 168.7603 168.9799 - 168.9663 172.7502 - 172.5346 174.7186 - 174.4509	duration: type: target unaz [deg] start - end 220.7016 - 220.8134 220.7060 - 220.8138 215.0042 - 215.0311 219.2944 - 219.3140 6 ( 1.00 h) conside duration: type: target 188.8009 - 188.6169 168.9799 - 168.7603 168.9799 - 168.7603 168.9799 - 168.7603	03:18:59 - 03:19:29 constant of the second
atellite scan. This p a priori scan (id: 0) source: GSAT0203 (PRN E26 station   delay   s' [5] [: HOBART12   6 HOBART12   6 HOBART12   6 KATH12M   6 YARRA12M   6 HOBART12   6	rocess is con (id: 336) (id: 336) (id: [s] [s] [s] [s] [s] 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 start scan (15) 26 179 1 1 24 86 1 19 91 1 19 91 1 20 90 1 53)	b   obs     [s]     [s]     0   30   0   30   0   30   0   30   0   30   selection: 0   403   0   437   0   402	duration start - end o3:18:59 - 03:19:29 03:18:59 - 03:19:29 03:18:59 - 03:19:29 03:18:59 - 03:19:29 03:18:59 - 03:19:29 03:18:59 - 03:19:29 2021.04.21 03:19:2 2021.04.21 03:19:2 03:21:35 - 03:28:18 03:21:35 - 03:28:18 03:21:35 - 03:28:17	are session, as it an an 220.7016 - 220.8134 220.7016 - 220.8134 220.7000 - 220.8134 2	duration: type: target unaz [deg] start - end 220.7016 - 220.8134 220.7016 - 220.8134 220.7000 - 220.8134 220.7000 - 220.8134 220.7000 - 220.8134 220.7000 - 220.8134 220.7000 - 220.8134 220.7016 - 220.8134 220.7016 - 220.8134 220.7010 - 220.8134 220.7010 - 220.8134 220.7010 - 220.8134 220.7010 - 220.8134 220.7010 - 220.8134 220.7010 - 220.8134 20.7010 - 20.8134 20.7010 - 20.8134 20.7010 - 2	03:18:59 - 03:19:29         colored and and and and and and and and and an

13

						a priori sca	an		
a priori scap	(id:	1)						duration: (	04.19.42 - 04.20.22
source: GSAT0	203 (PRN	E26) (id	d: 336)					type: target	single source scan
station	delay   [s]	slew [s]	idle [s]	preob [s]	obs [s]	duration start - end	az [deg] start - end	unaz [deg]   start - end	el [deg] start - end
HART15M HOBART12 HOBART26 KATH12M YARRA12M	6 6 6 6	0 0 0 0	0 0 0 0	10 10 10 10 10	40 40 40 40 40	04:19:42 - 04:20:22 04:19:42 - 04:20:22 04:19:42 - 04:20:22 04:19:42 - 04:20:22 04:19:42 - 04:20:22	130.6836 - 130.4033 240.1468 - 240.4131 240.1445 - 240.4107 224.0083 - 224.1768 230.3120 - 230.5564	130.6836 - 130.4033 240.1468 - 240.4131 240.1445 - 240.4107 224.0083 - 224.1768 230.3120 - 230.5564	37.1747 - 37.0893 29.6206 - 29.6530 29.6177 - 29.6501 21.8993 - 22.0615 46.2069 - 46.3834
			start	scan se	election	: 2021.04.21 04:20:22	2 - 2021.04.21 07:10:4	5 ( 2.84 h)	
depth: 0 scan: no016 source: 0104-/	3 (id: 408 (id:	20198) 13)						conside duration: ( type: target	red single scans 42 04:22:08 - 04:25:28 single source scan
HART15M HOBART12 HOBART26 KATH12M	6 6 6	19 32 90 34	71 58 0 56	10 10 10 10	114 200 63 200	04:22:08 - 04:24:02 04:22:08 - 04:25:28 04:22:08 - 04:23:11 04:22:08 - 04:25:28	123.9815 - 123.9016 258.1581 - 257.7798 258.1541 - 258.0348 219.4570 - 220.0656	123.9815 - 123.9016   258.1581 - 257.7798   258.1541 - 258.0348   219.4570 - 220.0656	27.9870 - 28.3425 56.3155 - 55.7160 56.3134 - 56.1245 52.9318 - 52.4141
YARRA12M depth: 0 scan: no016	6 4 (id:	33 20334)	57	10	174	04:22:08 - 04:25:02	220.3372 - 221.6525	220.3372 - 221.6525 consider duration: 0	74.1659 - 73.7490 red single scans 43 04:26:21 - 04:29:51
SOURCE: 0119+	115 (id:	18)	80	10	57	04.26.21 - 04.27.18	73 4896 - 73 3789	type: target	single source scan
HOBART12 HOBART26 KATH12M YARRA12M	6 6 6	37 141 29 35	0 33 8 28	10 10 10 10	210 75 210 157	04:26:21 - 04:29:51 04:26:21 - 04:27:36 04:26:21 - 04:29:51 04:26:21 - 04:29:51 04:26:21 - 04:28:58	313.8949       313.1154         313.8922       313.6130         312.6150       311.6726         344.3230       343.4001	313.8949         313.1154           313.8949         313.1154           313.8922         313.6130           312.6150         311.6726           344.3230         343.4001	22.7133         -         22.2465           22.7135         -         22.5474           52.1109         -         51.4807           47.7306         -         47.5712
						a priori sc	an		
a priori scan source: GSAT0	(id: 203 (PRN	2) E26) (id	d: 336)					duration: type: target	07:11:01 - 07:11:51 single source scan
station	delay   [s]	slew [s]	idle [s]	preob [s]	obs   [s]	duration   start - end	az [deg]   start - end	unaz [deg]   start - end	el [deg]   start - end
HART15M KATH12M YARRA12M	6 6 6	0 0 0	0 0 0	10 10 10	50 50 50	07:11:01 - 07:11:51 07:11:01 - 07:11:51 07:11:01 - 07:11:51 07:11:01 - 07:11:51	62.7393 - 62.4734 295.4019 - 295.7194 317.9045 - 318.1251	62.7393 - 62.4734 295.4019 - 295.7194 317.9045 - 318.1251	12.1318 - 11.9574 23.8953 - 23.7444 28.2648 - 27.9985
			star	t scan se	election	: 2021.04.21 07:11:5	1 - 2021.04.21 17:30:0	0 (10.30 h)	
depth: 0 scan: no020 source: 0420-	3 (id: 014 (id:	25216) 58)						conside duration: type: target	red single scans 44 07:13:00 - 07:15:13 single source scan
HART15M HOBART12 HOBART26 KATH12M YARRA12M	6   6   6   6	22 27 142 41 37	31 115 0 12 16	10 10 10 10 10	60   133   43   133   85	07:13:00 - 07:14:00 07:13:00 - 07:15:13 07:13:00 - 07:15:13 07:13:00 - 07:13:43 07:13:00 - 07:15:13 07:13:00 - 07:14:25	87.0260 - 86.9146 308.9075 - 308.3479 308.9040 - 308.7226 296.8393 - 296.2343 345.0227 - 344.3013	87.0260         86.9146           308.9075         308.3479           308.9040         308.7226           296.8393         296.2343           345.0227         344.3013	9.0544 - 9.2796 35.7207 - 35.4022 35.7206 - 35.6179 62.9955 - 62.5139 61.4353 - 61.3532
depth: 0 scan: no020 source: 0332-	4 (id: 403 (id:	25315) 39)						conside duration: type: target	red single scans 45 07:15:58 - 07:17:18 single source scan
HART15M HOBART12 HOBART26 KATH12M YARRA12M	6   6   6   6	33 23 119 25 33	69 6 0 4 44	10 10 10 10 10	51   80   30   80   72	07:15:58 - 07:16:49 07:15:58 - 07:17:18 07:15:58 - 07:17:18 07:15:58 - 07:16:28 07:15:58 - 07:17:18 07:15:58 - 07:17:10	122.5495 - 122.5236   255.7122 - 255.5608   255.7087 - 255.6519   224.2955 - 224.4754   230.9621 - 231.2703	122.5495 - 122.5236   255.7122 - 255.5608   255.7087 - 255.6519   224.2955 - 224.4754   230.9621 - 231.2703	33.0082 - 33.1698   51.3497 - 51.1122   51.3476 - 51.2585   48.7574 - 48.5309   70.1307 - 69.9259

For the other output files (SKD file, VEX file, NGS file) and the simulations have a look on previous manuals (automatic satellite scheduling).