

**Observational Astrophysics II**  
**Interferometric Practice Work Session 1**  
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**Observability and  $uv$  coverage**

ASPRO:

[http://www.jmmc.fr/aspro\\_page.htm](http://www.jmmc.fr/aspro_page.htm)

The user manual for ASPRO can be retrieved at the following link:

<http://www.jmmc.fr/doc/approved/JMMC-MAN-2100-0002.pdf>

The baseline lengths and orientations can be retrieved at the following link:

<http://www.eso.org/observing/etc/doc/vlti/baseline/lengthdata.txt>

This work session intends to give you a clear idea about the  $uv$  coverage you will get for baselines of different orientation and targets of different declination. It will also emphasize the delay line constraints for a 2 and a 3-telescopes array.

1. Sampling the  $uv$ -plane with the VLT

In this section you will make an intensive use of the OBSERVABILITY/COVERAGE menu of ASPRO.

<i><b>Objects</b></i>
V1280 Scorpii
BM Geminorum
NGC 1068
RY Sgr

1.1 Setting up the observations

- Chose the Full Aspro Interface
- In the WHEN menu (*Date & Time Setup*) select the date of 15-APR-2012 (the time doesn't matter) (Click Go and Close)
- In the WHERE menu, select *VLT, 2 Telescopes*
- In the WHAT menu, select *Get CDS object...* and write the name of the target (e.g. V1280\_Sco; *don't forget the underscore in the name!*) click Go and click once more on the Go button to confirm the coordinate and magnitude of the star. Close.

1.2 Observability of the stars

First we will check the observability of the sources at the date of 15-APR-2012

Go to OBSERVABILITY/COVERAGE menu and click on *Observability of Sources*. Set the minimum elevation to  $30^\circ$ , select *Plot twilights zones* and UT1-UT2 configuration. Then click on Go and write down the LST (Local Sideral Time) of the observability of the star. Do the same for each object of the list.

- i. Which objects are observable at this date and at what time?
- ii. Is there any common date for observing all stars together?

Now, go back to the WHAT menu and select the star RY Sgr. Go to OBSERVABILITY/COVERAGE menu and click on *Observability limit due to delay lines*.

- iii. Compare the observability of the object between UT1-UT2 and G1-J6 configurations. What do you conclude considering the length of each baseline configurations?
- iv. At which location the object is observable and why? Considering the G1-J6 configuration and that 120m is the maximum length for the delay line compensation, could you derive the maximum inclination angle (from the zenith) for which the star would still be observable?

### 1.3 *uv-track* for North-South and East-West baseline orientations

The goal of this section is to see how the *uv coverage* changes with baseline orientation.

Go to the OBSERVABILITY/COVERAGE menu and click on *UV coverage and PSF*. Set the *wavelength (microns)* to  $2\mu\text{m}$ . Then click on the arrow close to the *Push to validate entry PLOT UV COVERAGE*. Select one of the 2-telescope baseline oriented toward the North-South direction (see the schematic view of the VLTI configuration) and select 60min (AMBER integration time) in the *U-V Integration Time*. Now, have a look to the *uv coverage* you get by clicking on *PLOT UV COVERAGE*.

Change now the configuration from N-S to E-W and untick the *RESET FRAME* to superimpose both *uv coverages*.

- i. What do you conclude on the projected angle covered by each configuration? Could you give an explanation?
- ii. Which configuration is the more appropriate for an observation and why?

### 1.4 *uv-track* for a 3-telescopes array

Select now the *VLTI, 3 Telescopes* configuration (in the WHERE menu).

Visualize the observability of the RY Sgr (including constraint on delay lines) for configurations UT1-UT2-UT3 and UT1-UT2-UT4.

- i. What are your comments on the observability of the star?
- ii. How many delay lines are required to compensate for the optical paths difference?

Plot the *uv-track* of the observations at  $2\mu\text{m}$  using 60 minutes of UV integration time.

- iii. Which configuration would be the best to use and why?
- iv. Considering that the object presents a very close structure (*e.g. few stellar radii*) elongated in the North-East direction, choose the best configuration to use?