



Novelties in user support with JMMC tools throughout the proposal preparation cycle

Laurent Bourgès JMMC / OSUG
& JMMC Working groups Grenoble / Lyon / Paris / Nice



Outline

- JMMC overview
- Observation preparation tools:
 - Retrieve and visualize all VLTI past observations
 - Explore astrophysical models
 - Send your OBs to ESO/P2
- CHARA specific topics:
 - PoPs + unified instrument (all 4T to 6T)
 - 7th telescope project (user config)
- Demo
- 2022 Roadmap

JMMC overview

The **Jean-Marie Mariotti Center** coordinates the efforts of French Partner Laboratories with interferometric expertise to offer all the potential users of interferometric facilities the best operational environment.

The mission of JMMC is threefold and consists in:

- develop, produce, document and maintain the software necessary for the exploitation and the follow-up of new interferometric equipments, especially the VLTI,
- stimulate and coordinate the academic formation of non specialists,
- participate to the prospective around new interferometric instruments.

JMMC Service overview



French Expertise Center

User Support

+ TRAINING

+ OLBIN Publications DB

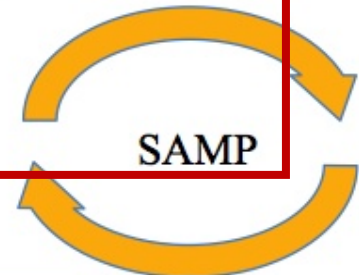
SearchCal

Aspro2

AMHRA

Prepare Observations

a2p2



Reduce data

amdlib pndrs

View Data

OIFits Explorer

Fit Models

LITpro

CDS Catalogs

JSDC2 JMDC

OiDB

L0 to L3 DataBases

Reconstruct Images

OImaging

See Ferreol's Next talk



Retrieve and visualize all VLT past observations

Integrate (VLT) observation records in ASPRO2

http://www.jmmc.fr/twiki/bin/view/Jmmc/Software/JmmcAspro2#Get_Information_about_past_obser



Obs logs

- Get latest obs from obs portal
 - Show table + details in tooltips
 - Filter records by instrument (more filters to come)

**Looking forward having CHARA logs in ASPRO2!
SPICA work in progress...**

Aspro2 - Aspro2_sample_rawobs.aspro

File Edit Interop Help

Targets
 Q Simbad
 DoAr 44
 Editor
 Sky

Main settings
 Interferometer: VLT
 Period: VLT Period 106
 Instrument: GRAVITY

Configuration(s)
 UT1 UT2 UT3 UT4
 A0 G1 J2 K0
 A0 G1 J2 J3
 K0 G2 D0 J3
 A0 B2 D0 C1

Constraints
 Night restriction
 Date: 2020/04/14
 Min. Elevation: 45 Wind
 Status: Information

Observability: VLT Interferometer - GRAVITY - UT1 UT2 UT3 UT4
 Day: 2020-04-14 - Moon = 47.0%

DoAr 44

08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00
 L.S.T.

Time: L.S.T. Night only Baseline limits Details
 Filters: Hide calibrators Hide ancillary stars

Observation Log (10):
 Type: SCIENCE
 Program ID: 0103.C-0097(B)
 Interferometer: VLT
 Baseline: U1 U2 U3 U4
 Instrument: GRAVITY
 Mode: HIGH-COMBINED
 1818 channels [1.95 - 2.45 μm] (res= 8000)
 Target: V2062Oph
 Coords: 16:31:34.0488 -24:27:37.548
 ID: GRAVI.2019-06-23T01:48:25.340_1
 Exp. time: 300 s
 Start time: 2019/06/23 01:48:25
 LST: 15.176 h
 Tau0: 3 ms
 Temp: 16.9 C
 Seeing: 0.9 arcsec

Filter by:	MIDI	AMBER	PIONIER	GRAVITY	MATISSE
Gro...					
19				GRAVI.2019-06-22T02:04:59.138_1	
19				GRAVI.2019-06-22T02:16:14.167_1	
19				GRAVI.2019-06-22T02:21:53.180_1	
19				GRAVI.2019-06-22T02:27:26.194_1	
19				GRAVI.2019-06-22T02:32:56.209_1	
19				GRAVI.2019-06-22T02:38:35.222_1	
19				GRAVI.2019-06-22T02:51:26.255_1	
19				GRAVI.2019-06-22T02:57:05.268_1	

OIFits done. 549 M Provided by JMIMC

Obs logs

Show UV tracks of (filtered) past VLTI observation records

Note: each ESO O.B. gives projected baseline (radius + pa) + mjd times

Allows for an updated uv coverage monitoring!

The screenshot shows the Aspro2 software interface for monitoring VLTI observations. The main window displays a UV coverage plot titled "VLTI Period 106 - GRAVITY - UT1 UT2 UT3 UT4" for the date 2020-04-14 and source DoAr 44. The plot shows UV tracks in the U-V plane, with U (m) on the horizontal axis and V (m) on the vertical axis. The tracks are color-coded and show a curved pattern. A tooltip provides detailed information for a selected observation, including the base line (U1-U4), observation log, type (SCIENCE), program ID (0103.C-0097(B)), interferometer (VLTI), baseline (U1 U2 U3 U4), instrument (GRAVITY), mode (HIGH-COMBINED), target (V2062Oph), coordinates, ID, exposure time, start time, LST, radius, position angle, and seeing.

The interface includes several control panels:

- Targets:** Search for "Simbad" and select "DoAr 44".
- Main settings:** Interferometer: VLTI, Period: VLTI Period 106, Instrument: GRAVITY.
- Configuration(s):** UT1 UT2 UT3 UT4, A0 G1 J2 K0, A0 G1 J2 J3, K0 G2 D0 J3, A0 B2 D0 C1.
- Constraints:** Night restriction (checked), Date: 2020/04/14, Min. Elevation: 45, Wind (unchecked).
- Observability:** Instrument mode: LOW-COMBINED, AO setup: MACAO, Atmosphere quality: Average, Fringe tracker mode: FringeTrack GRAVITY, U-V range to plot (m): 139.06, Sampling Periodicity (min): 60, Total Integration time (s): 600, HA min: -3.32, HA max: 2.03, Plot rise/set uv tracks (checked), Underplot a model image (checked), Plot what...: AMP, Compute OIFits data (checked).

At the bottom, a table lists observation records with columns for Gro..., Id, Type, Parent Id, Program, Array, Stations, Ins. Nar, and a list of observation IDs. The table is filtered by "GRAVITY".

Filter by:	MIDI	AMBER	PIONIER	GRAVITY	MATISSE		
Gro...	Id	Type	Parent Id	Program	Array	Stations	Ins. Nar
19	GRAVI.2019-06-22T02:04:59.138_1	SCIENCE	42971	0103.C-0097(A)	VLTI	U1 U2 U3 U4	GRAVITY
19	GRAVI.2019-06-22T02:16:14.167_1	SCIENCE	42971	0103.C-0097(A)	VLTI	U1 U2 U3 U4	GRAVITY
19	GRAVI.2019-06-22T02:21:53.180_1	SCIENCE	42971	0103.C-0097(A)	VLTI	U1 U2 U3 U4	GRAVITY
19	GRAVI.2019-06-22T02:27:26.194_1	SCIENCE	42971	0103.C-0097(A)	VLTI	U1 U2 U3 U4	GRAVITY
19	GRAVI.2019-06-22T02:32:56.209_1	SCIENCE	42971	0103.C-0097(A)	VLTI	U1 U2 U3 U4	GRAVITY
19	GRAVI.2019-06-22T02:38:35.222_1	SCIENCE	42971	0103.C-0097(A)	VLTI	U1 U2 U3 U4	GRAVITY
19	GRAVI.2019-06-22T02:51:26.255_1	SCIENCE	42971	0103.C-0097(A)	VLTI	U1 U2 U3 U4	GRAVITY
19	GRAVI.2019-06-22T02:57:05.266_1	SCIENCE	42971	0103.C-0097(A)	VLTI	U1 U2 U3 U4	GRAVITY

At the bottom right, a status bar shows "OIFits done." and "510 M". The footer includes the text "The Sharpest Eyes on the Sky" and "Provided by JMIMC".



Explore astrophysical models

User models in ASPRO2

http://www.jmmc.fr/twiki/bin/view/Jmmc/Software/JmmcAspro2#User_defined_model

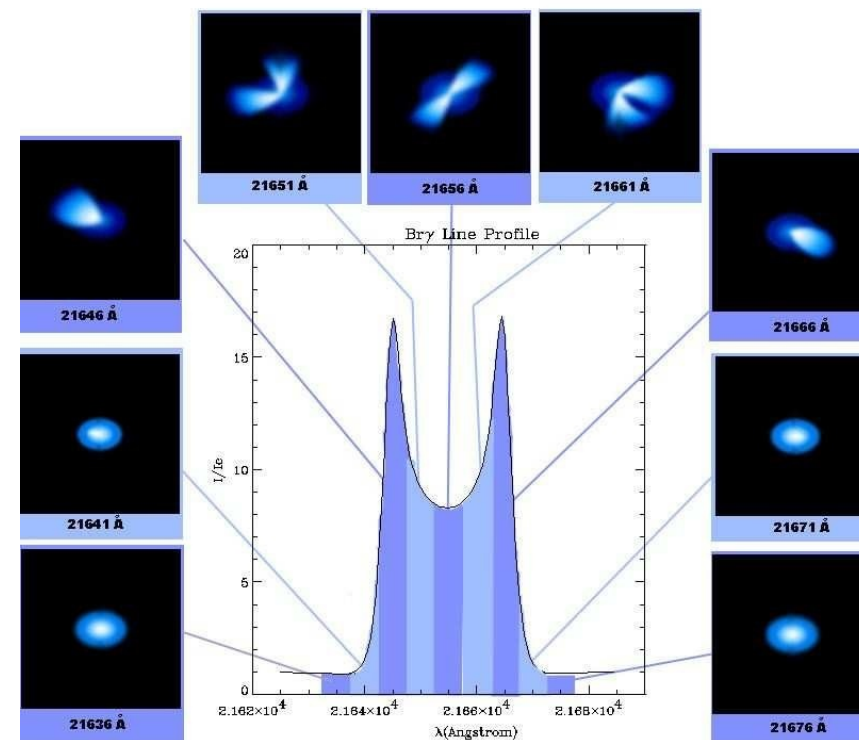


Importing FITS polychromatic cubes

ASPRO2 User models consist in providing FITS image (gray model) or FITS cubes (polychromatic models) instead of analytical models

Be careful:

- spatial sampling
- spectral sampling vs instrumental resolution



AMHRA Service

AMHRA develops and provides online astrophysical models and data analysis tools dedicated to the scientific exploitation of high angular and high spectral facilities such as ESO-VLTI

- New astrophysical models (parametric and grids) <https://amhra.oca.eu>

PI: Armando Domiciano de Souza

Real time astrophysical models

- Kinematic Be disk**
Model of the geometry (size and shape) and kinematics (rotation and expansion) of circumstellar, flat, rotating disks, relevant to Be stars. It is suited to interpret spectro-interferometric data obtained on emission lines formed in the disk.
- Disk and stellar continuum – DISCO**
Model of the continuum emission from a star surrounded by a gaseous circumstellar disk (free-free and bound-free), with partially ionized and geometrically thin disk with a physical structure given by the viscous Keplerian accretion disk model. DISCO is well suited to model Be stars.
- Evolved stars (RSG, AGB)**
Stellar surface maps of evolved stars (RSG and AGB) computed from a 3d hydrodynamical simulation with COSBOLD-OPTIM3D. The available model corresponds to a star similar to the famous RSG Betelgeuse.
- Binary spiral model**
Phenomenological model mimicking the shock caused by the collision between the winds from massive stars (e.g. WR and OB stars) and that results in dusty spirals.
- Analytical Limb-darkening Elliptical or Spherical – ALDES**
ALDES provides intensity maps (images) or 1d intensity profiles for spherical or elliptical stars showing the limb darkening (LD) effect. Different LD laws are offered: uniform disk, linear, power law, quadratic, square root, logarithmic and four-parameter.

Precalculated grids of astrophysical models

- Supergiant B[e] with HDUST**
Grid of models for B[e] supergiant stars computed with the 3d Monte Carlo radiative transfer code HDUST. The non-spherical circumstellar envelope (CSE), composed of gas (hydrogen) and dust (silicate), is modelled considering a bimodal outflow description (two-component wind).
- Limb-darkening with SATIAS**
Grid of models providing intensity maps for spherically symmetric stars, showing the limb darkening effect. The models were computed with the SATIAS model stellar atmospheres for several spectral bands. Data is provided for FGK dwarfs and red giants.

Simulated data - GRAVITY HIGH

Aspro2 - amhra_be.asprox [c1]

File Edit Interop Help

Targets

- Simbad
- eta Tau Editor

Sky

Main settings

Interferometer: VLTI

Period: VLTI Period 110

Instrument: GRAVITY

Configuration(s)

UT1	UT2	UT3	UT4
A0	G1	J2	K0
A0	G1	J2	J3
K0	G2	D0	J3
A0	B2	D0	C1

Notebook | Obs plan | Map | Observability | UV coverage | OIFits viewer

plot | data

VLTI - GRAVITY [2.1594 μ m - 2.1732 μ m] - UT1-UT2-UT3-UT4

Day: 2022-10-08 - Source: eta Tau

Target Editor

Targets | Models | Groups

Model: eta Tau

Mode: Analytical User Model

State: enabled disabled Info

File: /home/bourges/ASPRO2/fits/tmp/output_Be... Open

Scale: 9.1391E-3 9.1391E-3 linked

Rotation: 0.00 reset AMHRA

Fits Image

Coordinates:
RA: 00:00:00
DE: +00:00:00

Increments:
RA: 9.14E-3 mas
DE: 9.14E-3 mas

Image FOV:
2.34 mas

Pixels:
256 x 256

Image: 25/51

Model λ:
2.166 μ m

LUT table aspro-is... | Color scale: LINEAR | Display keywords | Ruler | Auto

Cancel OK

Infos:

ADF Show VISAMP, VISPHI vs EFF_WAVE

x Axis: EFF_WAVE log inc. 0 def. range auto * default * fixed 2.1587 2.1739

y Axes: VISAMP log inc. 0 def. range auto * default * fixed 0.9 1.1

VISPHI log inc. 0 def. range auto * default * fixed -9.4261 8.7122



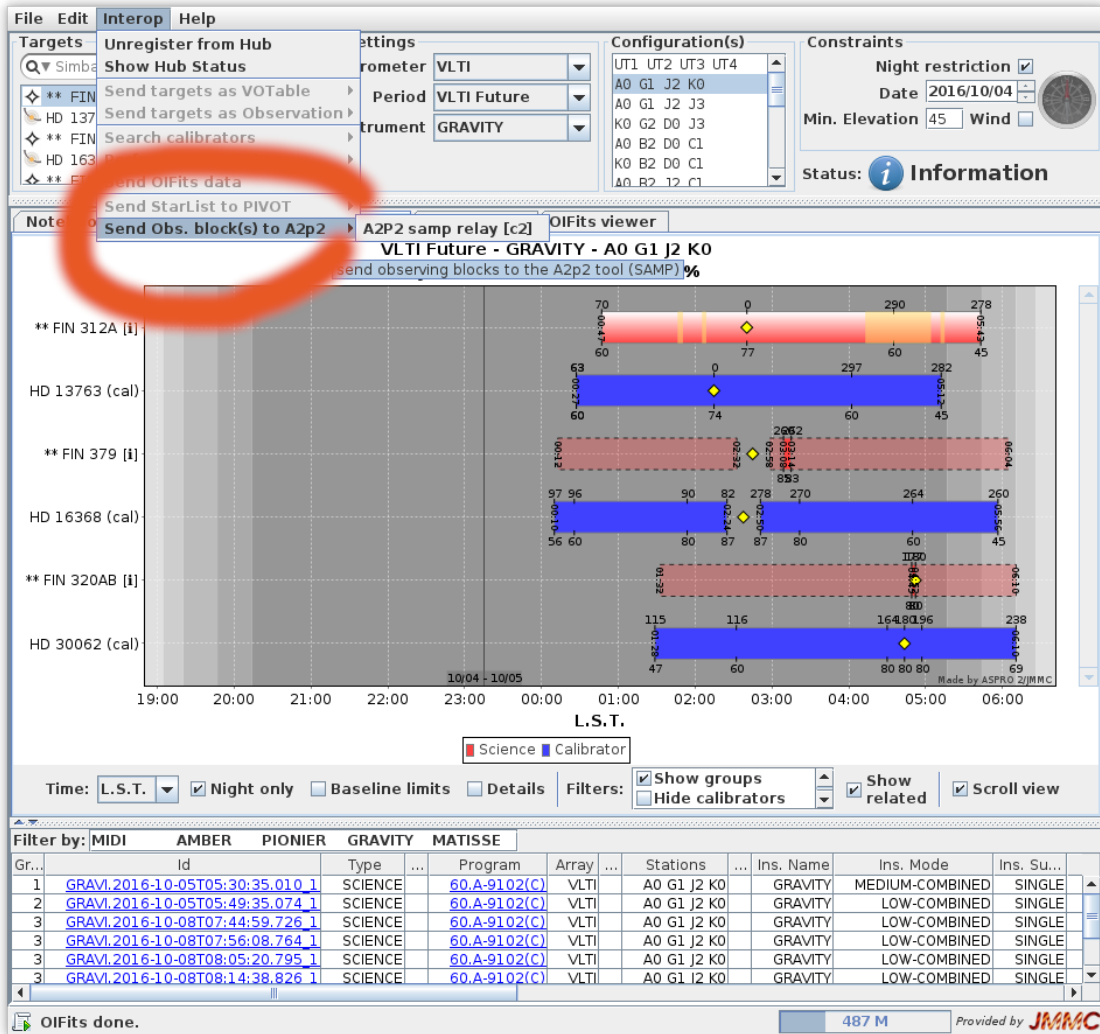
Send your OBs to ESO/P2

ASPRO2 + A2P2

<https://github.com/JMMC-OpenDev/a2p2/wiki/ASPRO2-A2P2-Tutorial>



A2P2, the ASPRO2 companion tool in Python



Send your VLT OB from ASPRO2 to ESO p2: PIONIER, GRAVITY & MATISSE

Project ID	Instrument	Container type
60.A-9003(L)	GRAVITY	VM Run (IP 107.01)
New Folder	GRAVITY	Folder
GRAVITY Test Tristra	GRAVITY	Folder
New Folder	GRAVITY	Folder
WDS_J00003_441	GRAVITY	Folder
New Folder	GRAVITY	Folder
New Folder	GRAVITY	Folder
New Folder	GRAVITY	Folder
GRAVITY tests Julien	GRAVITY	Folder
Christian	GRAVITY	Folder
60.A-9003(M)	MATISSE	VM Run (IP 107.01)
60.A-9003(N)	PIONIER	VM Run (IP 107.01)
60.A-9252(M)	GRAVITY	SM Run (IP 107.01)
60.A-9252(N)	MATISSE	SM Run (IP 107.01)
60.A-9253(T)	PIONIER	SM Run (IP 107.01)

Phase 2 v2.8.34

Your Observing Runs

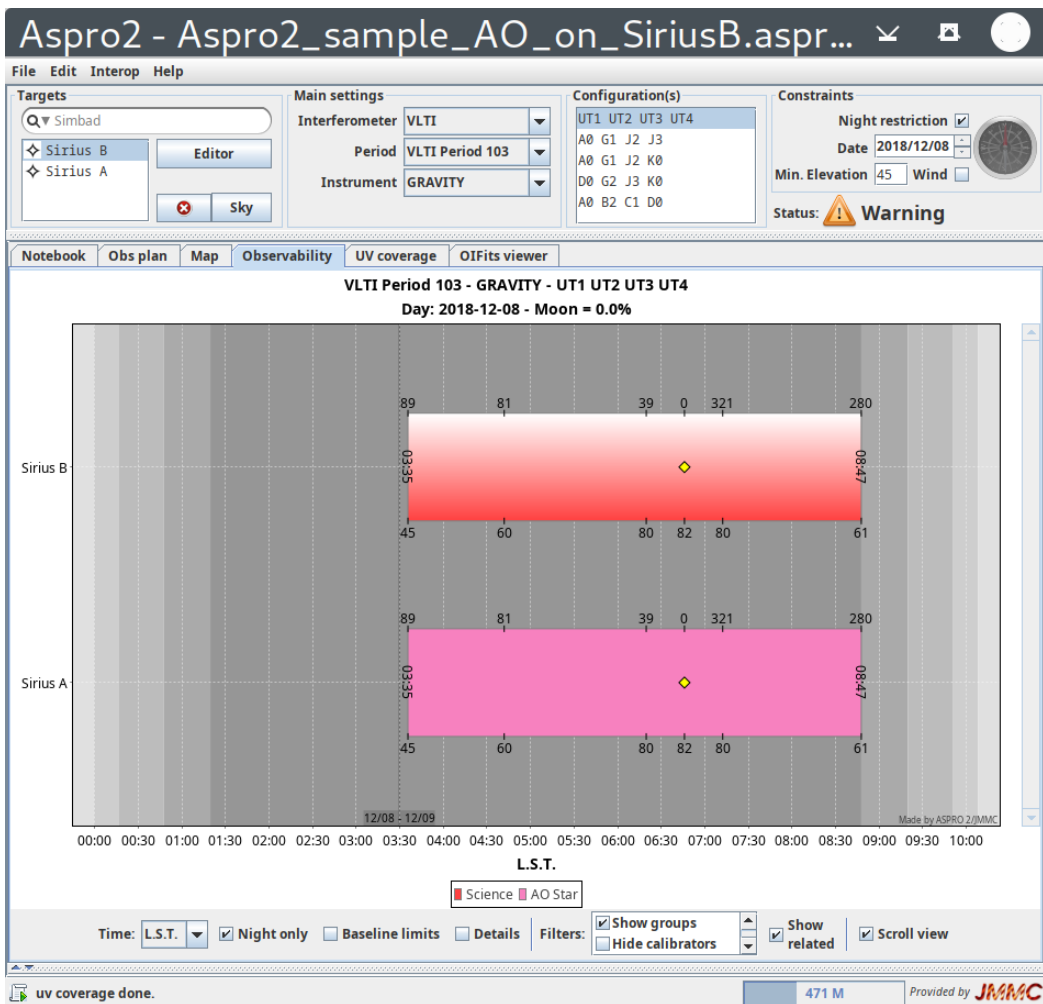
Sort by: Nothing selected

- + 60.A-9108(A) · GRAVITY 0
- + 60.A-9108(B) · GRAVITY 2

<https://www.eso.org/p2>

Try A2P2:
`pip install a2p2`

Target Groups : AO / FT stars, custom



Target Editor

Targets Models Groups

Targets:

Target: Sirius A

AO Star FT Star Guide Star

Group: Name: AO Star, Category: [OB], Desc: Group indicating stars used by the Adaptive Optics system

Color: #F781BF

Create Custom Groups to arrange your targets (backup, priority ...)



CHARA enhancements in ASPRO 2

Unified instruments, fixed PoPs, custom Configuration (7T)



CHARA configuration : unified instruments

No more MIRC_4T, MIRC_6T => all merged

So all possible configurations gathered and can be compared

Added MYSTIC as K modes in renamed MIRCX_MYSTIC instrument !

New CHARA instrument list:

[CLASSIC](#)

[CLIMB](#)

[FRIEND](#)

[JOUFLU](#)

[MIRC](#)

[MIRCX-MYSTIC](#)

[PAVO](#)

[SPICA](#)

[VEGA](#)

CHARA fixed Pops

= Pops set per stations whatever configurations are selected

Easier comparison in case of switching from 6T to 5T (loss of 1 scope)

Used on

baseline limits too

Improved conf. label

(Station + Pops)

Aspro2 - Aspro2_sample.aspro

Main settings

Interferometer: CHARA

Period: CHARA 2022B

Instrument: MIRCX-MYSTIC

PoPs: [Auto] [set] [clear]

Fixed: E1 1 W2 5 W1 2 S2 2 S1 3 E2 3

Current: E1(1) W2(-) W1(2) S2(2) S1(3) E2(3)

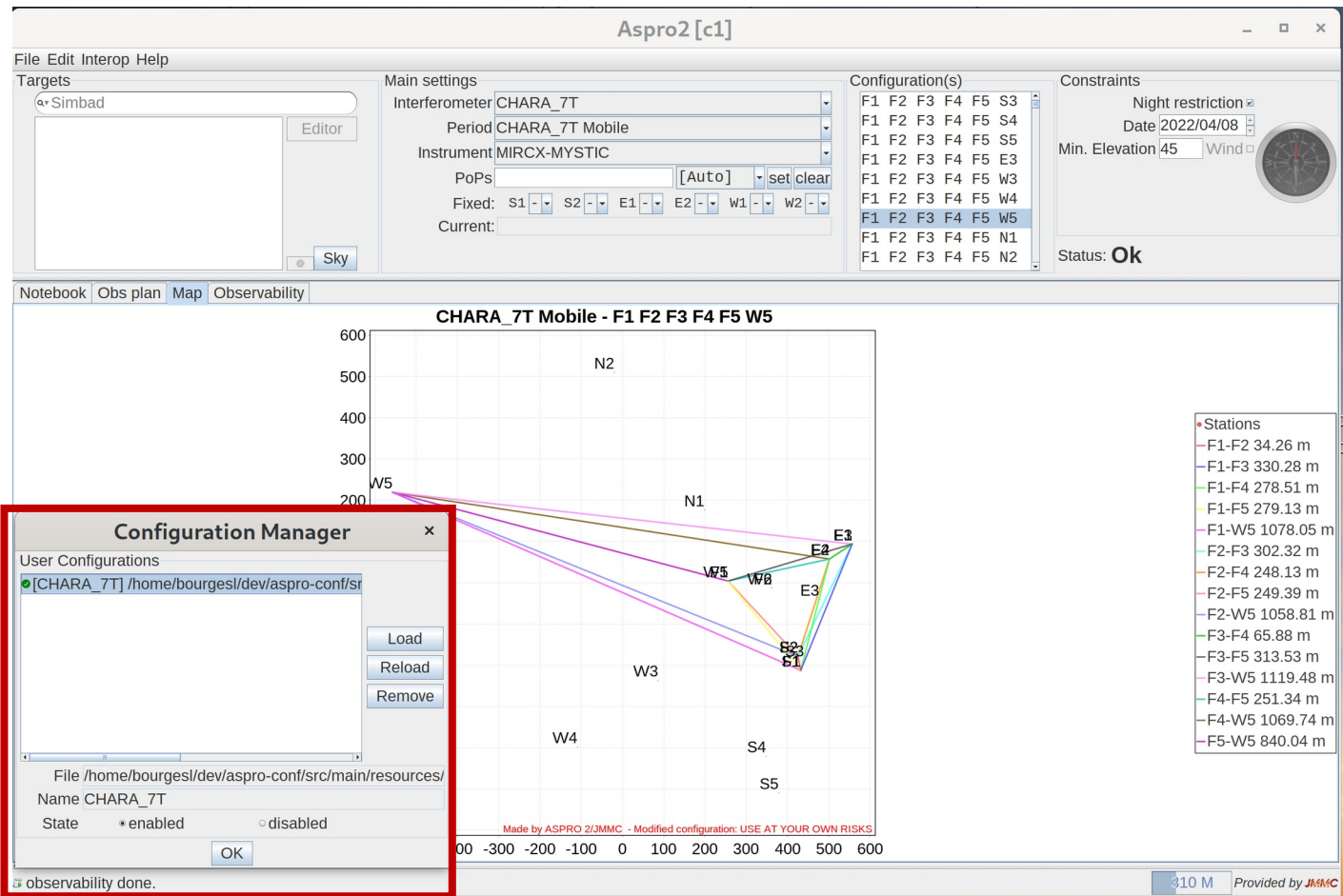
Configuration(s)

E1	W2	W1	S2	S1	E2
E1	W2	W1	S2	S1	
E1	W2	W1	S2	E2	
E1	W2	W1	S1	E2	
E1	W2	S2	S1	E2	
E1	W1	S2	S1	E2	
W2	W1	S2	S1	E2	
E1	W2	W1	S2		
E1	W2	W1	S1		
E1	W2	W1	E2		

CHARA 2022B - MIRCX-MYSTIC - E1(1)-W1(2)-S2(2)-S1(3)-E2(3)

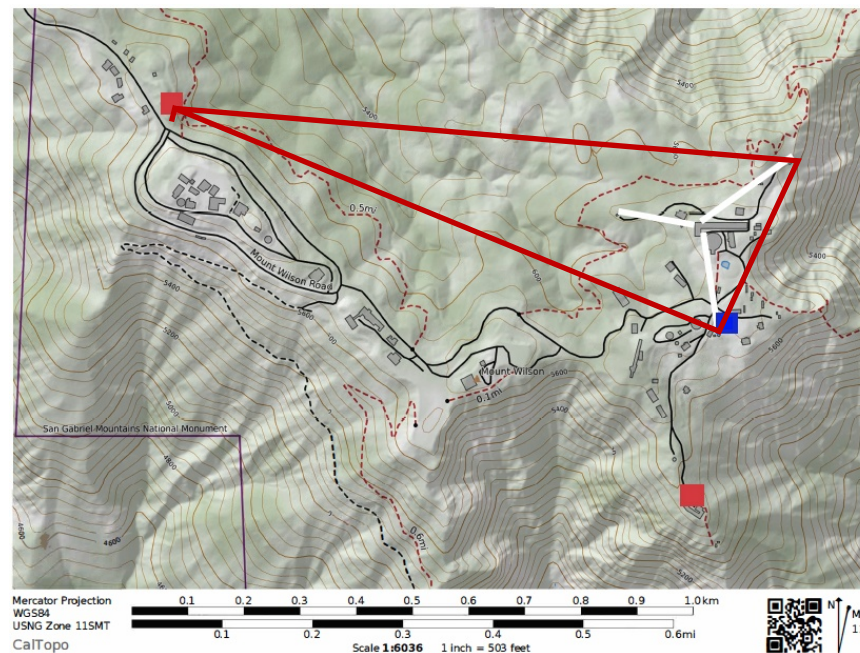
CHARA upgrade in ASPRO2: 7th telescope project

7th fibered telescope coming in 2022 => Custom configuration CHARA_7T



- all mobile stations
- configurations: 5 fixed + 1 mobile
- instruments in H band

Work in progress...



Expert mode



Demo

2022 roadmap

- On-going projects :
 - SPICA-DB @ JMMC
 - Oimaging enhancements
- Coming OIFitsExplorer enhancements: filtering
- Later JSDC3 / SearchCal in 2022

- More codes opened:
 - <https://github.com/JMMC-OpenDev/>
 - <https://gricad-gitlab.univ-grenoble-alpes.fr/OSUG/JMMC>

Final words

Please submit your published data into OiDB

*Please report any problem or question to the JMMC User Support
(SUV team) at*

www.jmmc.fr/support

Feedback always appreciated and useful !



Complementary slides

SearchFTT

Search Fringe Tracker Targets within 1' (K < 17.5) for GRAVITY WIDE / VLT

- Dynamic queries to get candidates:
 - Simbad
 - crossmatch GAIA : GAVO & ESAC
- Display table results & FOV image (AladinLite)

<https://searchftt.jmmc.fr>

GRAVITY-wide: finding off-axis fringe tracking targets.

This newborn tool is in its first version and is subject to various changes in its early development phase.

Underlying method:

You can query one or several Science Targets. For each of them, three results of Fringe Tracker Targets will be given using following research methods:

1. Simbad for sources that are suitable for fringe tracking.
2. GAIA DR2 catalogues with its external catalogues cross-match through ESA archive center.
3. The Astrophysical Parameters from Gaia DR2, 2MASS & ARIWIDE catalog through the GAVO DC.

Each query is performed within 30" of the Science Target. A magnitude filter is applied on every Fringe Tracker Targets according to the best limits offered in P110 for UT (MACAO) OR AT (NAOMI) respectively (K < 11 AND V < 15) OR (K < 10 AND R < 12.5). When missing, the V and R magnitudes are computed from the Gaia G, Grb and Grp magnitudes. The user must refine its target selection to take into account VLT Adaptive Optics specifications before we offer a configuration selector in a future release.

- Enter name, the resolution of which is relied on Simbad, in the Text Box below.
- To send a target to Aspro2 (already open), click on the icon in the GetStar column, then press "Send Votable".
- Please fill a report for any question or remark.

HD224803, HD123, DH38

HD224803 - 0.20702433180999996 36.78009900429

1. Simbad Name	dist_as [arcsec]	ra [deg]	dec [deg]	pmra [mas.yr ⁻¹]	pmdec [mas.yr ⁻¹]	G	K	V	R	otype_txt	GetStar
BD+35_5153B	15.38	0.203	36.778	-25.179	-21.605	10.379	8.82	10.22	*		

2. Simbad link	dist_as [arcsec]	ra [deg]	dec [deg]	pmra [mas.yr ⁻¹]	pmdec [mas.yr ⁻¹]	mag_g [mag]	mag_v [computed]	mag_r [computed]	h_mag [mag]	k_mag [mag]	tmass_dist [arcsec]	2MASS J	GetStar
HD 224803	0.515	0.207	36.78	-24.51	-22.217	8.044	8.264	7.785	6.23	6.181	0.145	00004	
BD+35_5153B	15.893	0.203	36.777	-24.919	-21.424	10.378	10.526	10.146	8.949	8.82	0.142	00004	

3. Simbad link	dist_as [arcsec]	ra [deg]	dec [deg]	mag_g [mag]	mag_ks [mag]	mag_v [computed]	mag_r [computed]	GetStar
BD+35_5153B	15.447	0.203	36.777	10.378	8.82	10.526	10.146	
HD 224803	0.077	0.207	36.78	8.044	6.181	8.264	7.785	

[View original votable @ GAVO](#) (<COOSYS xmlns="http://www.ivoa.net/xml/VOTable/v1.3" ID="system" epoch="J2015.0" system="ICRS"/>)

HD123 - 1.565892167945309 58.43672797620039

1. Sorry, no fringe tracking star found for HD 123 in Simbad.
2. Sorry, no fringe tracking star found for HD 123 in <https://gea.esac.esa.int/archive/>.
3. Sorry, no fringe tracking star found for HD 123 in the GAVO's [gdr2ap catalogue](#).

DH38 -
Can't get position from Simbad, please check your identifier.

Show more information

powered by

JMMC Obs Portal

<http://obs.jmmc.fr/>

(Python / postgresql web app)

- VLT Observation records
 - all instruments
 - Hourly ESO sync (TAP)
- OiDB sync => L0 ESO
- Future:
 - Better filtering in ASPRO2
 - VO TAP interface
 - Improved target identification (few as)
 - **Ingest CHARA & SPICA logs**

ObsPortal

The JMMC ObsPortal service provides both a web interface and a cone-search service (TAP in the future) on its database containing raw optical interferometry observations (L0):

- ESO archive provides VLT observations (observing blocks & exposures). Supported instruments are MIDI, AMBER, PIONIER, GRAVITY, MATISSE.

The JMMC also provides the OiDB service that contains published & science-ready datasets (L2, L3) in the OIFITS file format.

Please contact the [JMMC user support](#) for any remark or issue on this service.

Change log

- 2020.05.05: Release 20.05:
 - Automatic synchronization (ESO TAP)
 - Added UV points per baseline and atmospheric conditions
 - Improved performance: indexes + rewritten VOTable writer
 - Improved header validation
- 2020.02.25: First release, integrated in ASPRO2 20.03

Database statistics	
Header count	1131493
Target count	37564
Observation count	50484
Exposure count	381082
Valid exposure count	374330 (98.23%)
Exposure Date min	2003-06-14 07:13:36.000
Exposure Date max	2022-04-12 23:40:16.781
Header last ModificationDate	2022-04-15 10:36:21

SPICA-DB in action



SPICA-NSS TOOL

Date (YYYY-MM-DD) 2022-04-06 2022-04-06

Workpackages

Modes

Priority_final 1 2 3

Declination DEC_MIN -30 DEC_MAX 90.0
Magnitude VMAG_MIN -3.0 VMAG_MAX 8.0

Primary calibrators: RA range (min) 60 DEC range (deg) 5 Vmag range 2 GO
Secondary calibrators: RA range (min) 60 DEC range (deg) 2 Vmag range 0
Max. LDD Chi2 2 Max. rel. error (%) 10 Min. vis2 0.9 GO

Log

643 (0/0/643) observable targets on 2022-04-06

Priority_final = 1
Priority_final = 2
Priority_final = 3

- DIA (0/0/116)
- DLD (0/0/436)
- ▲ IMA (0/0/8)
- ◆ TMP (0/0/42)
- ▼ SPI (0/0/41)

SAMP



VOTABLE

Aspro2 - S06.asproxc [c1]

File Edit Interop Help

Targets: Q Simbad

Main settings: Interferometer CHARA, Period CHARA Future, Instrument SPICA

Fixed: S1 S2 W1 W2 E1 E2 E3

Current: S1(1) S2(2) W1(2) W2(5) E1(2) E2(3)

Constraints: Night restriction, Date 2021/10/01, Min. Elevation 30

Status: Warning

CHARA Future - SPICA - S1(1)-S2(2)-W1(2)-W2(5)-E1(2)-E2(3)
Day: 2021-10-01 - Source: pi. Cas

U (MA - 10⁻⁶/rad)

V (m) - East

Legend: S1-S2, S1-W1, S1-W2, S1-E1, S1-E2, S2-W1, S2-W2, S2-E1, S2-E2, W1-W2, W1-E1, W1-E2, W2-E1, W2-E2, E1-E2