

Making use of the VLT Interferometer

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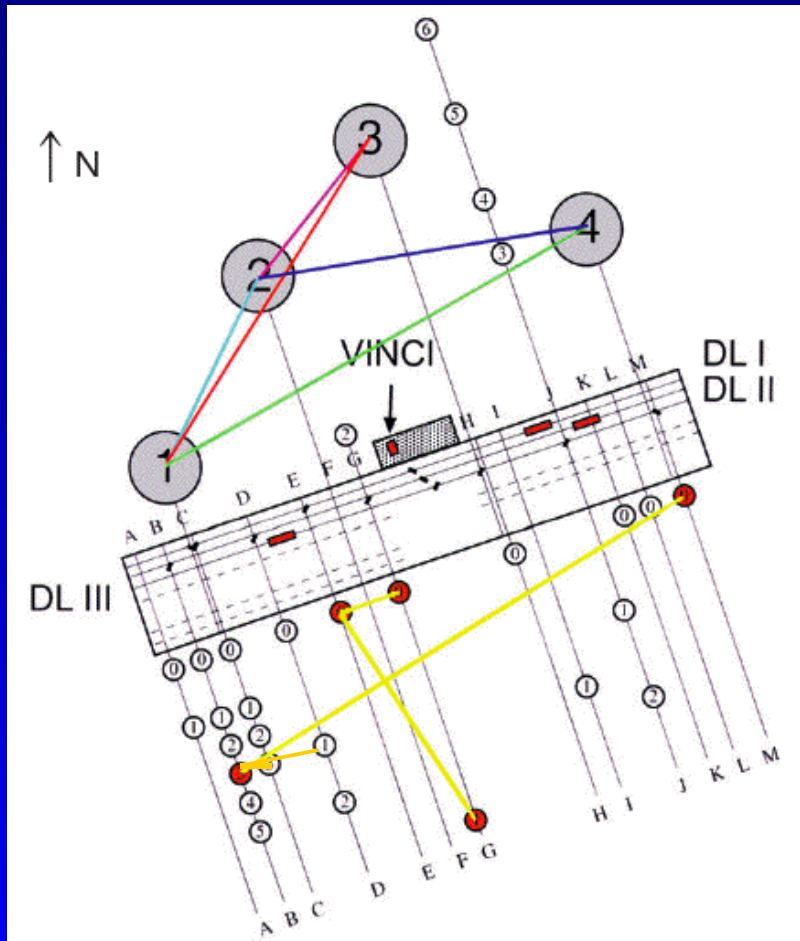


Vitacura,
January 28, 2004



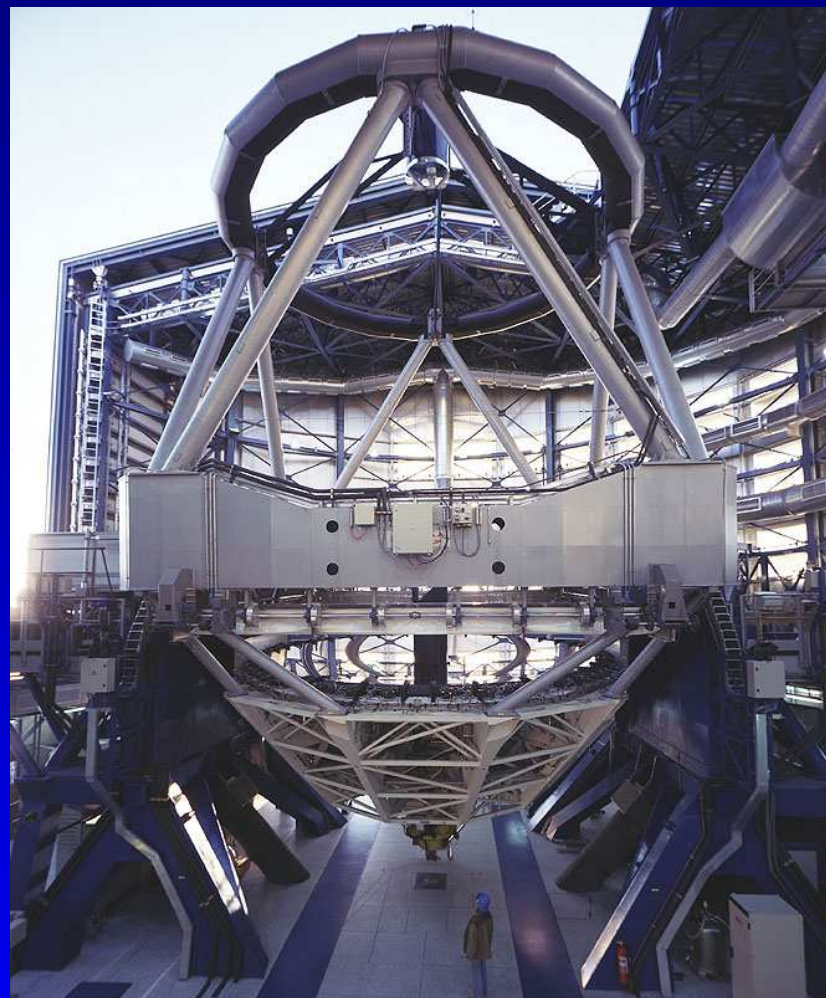
- Four 8m telescopes
- All equipped with AO
- Baselines 47m-130m
- Four 1.8m telescopes
- Movable to 30 stations
- Baselines 8m-202m
- Six delay lines
- PRIMA
- FINITO
- VINCI/MIDI/AMBER/GENIE

Status



- 2 Siderostats on six baselines
- All UT Coude trains
- UT2 and UT3 full AO (MACAO)
- UT1 tip/tilt (STRAP)
- AT1 just had first light
- Transfer Optics
- 3 Delay Lines
- VINCI
- MIDI
- AMBER today on way to Paranal
- FINITO
- Four astronomers, three fellows, several TIOs in Chile

The VLT Telescopes



The MACAO Coude AO systems



View of the First MACAO-VLTI Facility at Paranal

ESO PR Photo 12a/05 (15 May 2005)

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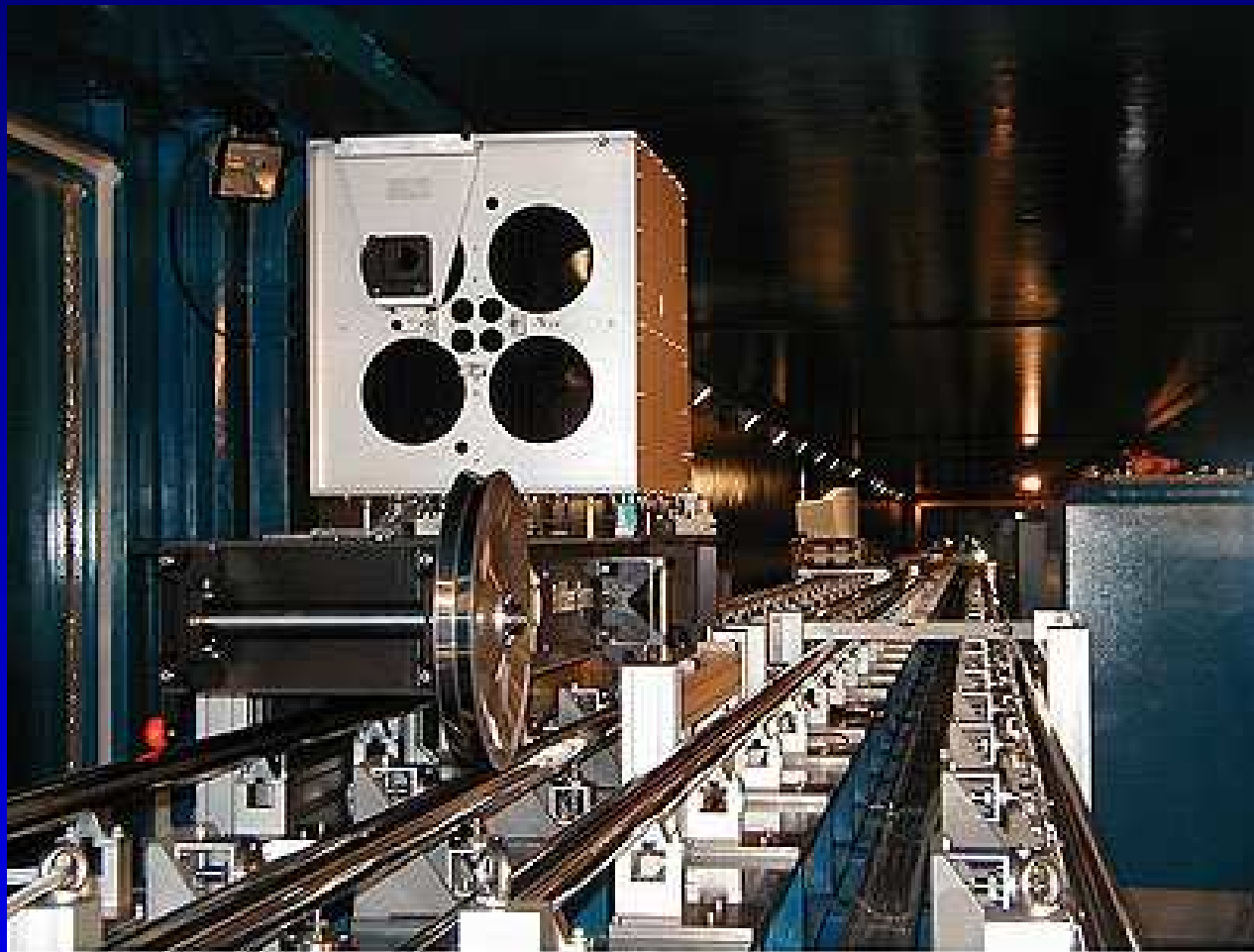
- **First MACAO system installed on UT2 in April 2003**
- **Second system followed on UT3 in July 2003**
- **Third system on UT4 in July 2004**
- **Last system on UT1 in January 2005**
- **AO assisted fringes obtained in August 2003**

Adaptive Optics and Fringe Tracking



- **Adaptive Optics will help injecting more light into a spatial filter**
- **Fringe Tracking allows to integrate longer, keeping the fringe stable at a given position**

Delay Lines



VLT Delay Line Retroreflector Carriage

ESO PR Photo 26c/00 (11 October 2000)

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VLTI Instrumentation



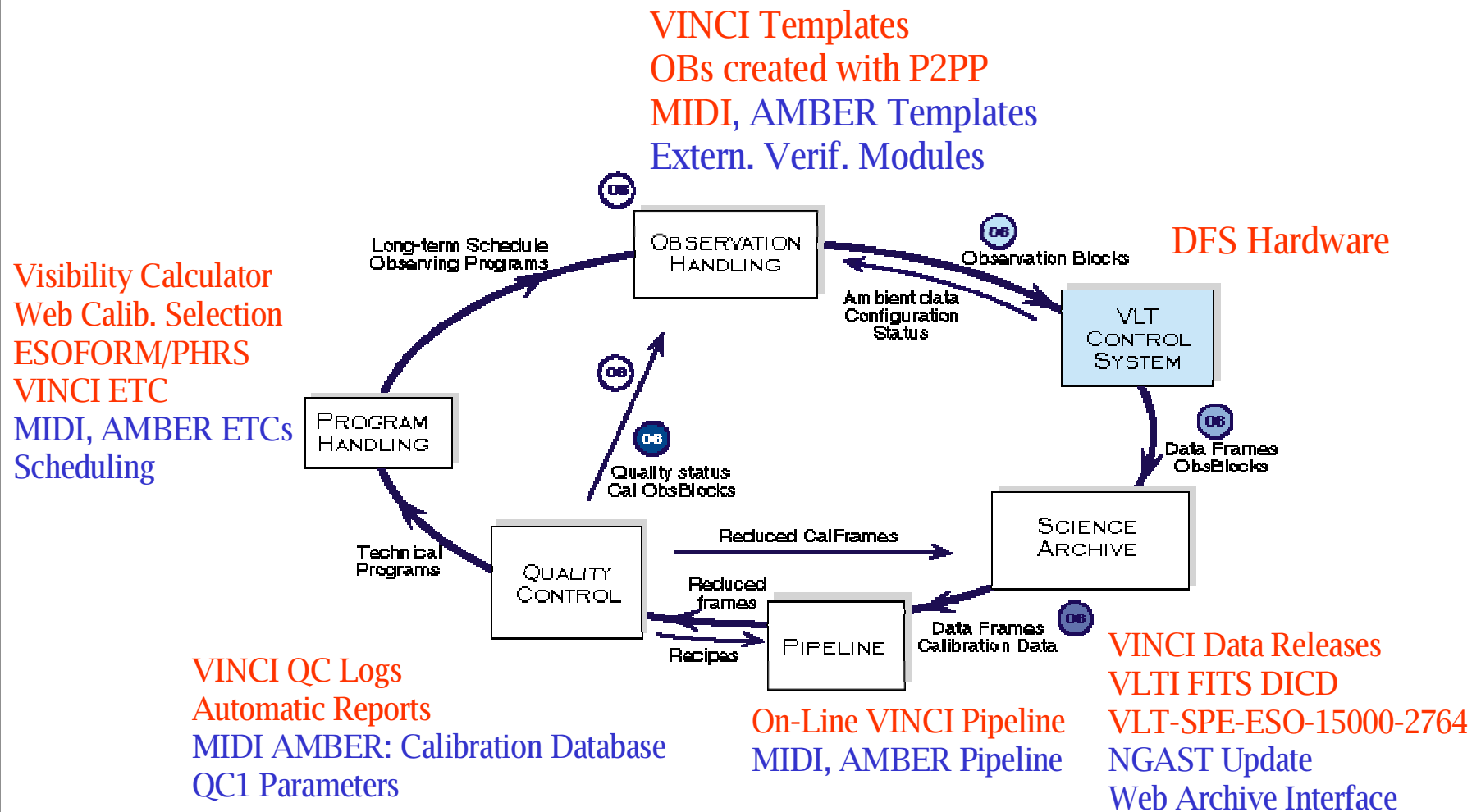
	Bands	# telescopes	spectral resolution	beam combination
VINCI	K	2	5	coaxial
AMBER	J,H,K	3	10,000	multiaxial
MIDI	N,(Q)	2	300	coaxial

What the VLTI will offer



- April 2004: MIDI in prism mode and baselines UT2/3
- October 2004: MIDI in prism/grism and sciphot modes on baselines UT2/3, UT2/4, UT3/4, including dispersed fringe tracking
- April 2005: AMBER and MIDI on all baselines with either three (two) UT or two AT, external fringe tracking (FINITO)
- October 2005: AMBER also with three AT
- ...

VLTI Data Flow System



Call for Proposals



Call for Proposals - P74



6.8 MIDI, MID-infrared Interferometric instrument

MIDI (MID-infrared Interferometric instrument) is the VLTI instrument for N-band (8 to 13 micron) interferometry. It is a two beam combiner providing values of moduli of fringe visibility sampled in the (u,v) plane. "First fringes" were obtained with MIDI in December 2002. First observations have been carried out in 2003 to characterize the instrument and demonstrate its capabilities. MIDI will be available in both service and visitor modes, with a limited number of observations.

MIDI will be offered for P73 with:

- two Unit Telescope (UT) baselines:

- UT1-UT3-102m between April and June 2004
- UT2-UT3-47m for the full period

- a limiting magnitude of $N=2.5$ (5 Jy) on unresolved objects (with internal fringe tracking)
- a visible limiting magnitude of $V=16$ for Coude guiding
- fringe acquisition in "Fourier" mode only
- dispersed mode (prism) only

Details on MIDI and its instrumental modes can be found in the MIDI web page and User Manual (<http://www.eso.org/instruments/midi>).

Time will be allocated in one hour slots per calibrated visibility point, independent of source flux or visibility.

This includes, for the target and one calibrator (defined at phase 2 proposal preparation):

- acquisition
- photometry
- fringe track, typically consisting of a few hundreds scans, each scan covering 6-10 fringes with 5 samples per fringe.

The raw accuracy of the visibility measurements is of the order of 20%. It is expected that this accuracy will be significantly improved when calibration and data reduction procedures are refined.

A proposal can consist of different observations of the same target with different baselines and / or hour angles, in which case the observing time to be requested simply consists in the number of required time slots multiplied by the duration of one slot (1 hr).

Time constrained observations (e.g. variable objects) can further be requested in the appropriate section of the Phase I proposal.

However, VLTI+ MIDI observations will be allocated block wise when the accepted proposals are known. This may impair the feasibility of programmes with too many constraints. ESO recommends to propose observations that can typically be completed in one night or less.

MIDI will be used like any VLT instrument. We invite astronomers intending to observe with MIDI to check the MIDI page on the ESO web site regularly, in order to be aware of the latest development of the instrument. The User Manual of MIDI can be downloaded from:

<http://www.eso.org/instruments/midi>

- **Call for Proposals to be released on Mar 01, 2004**
- **Proposal deadline on Apr 01, 2004**
- **Observing October 04 - March 05**

Proposals - Checklist 1



- Is my source bright enough? (e.g. AMBER K~8 on ATs, K~12 on UTs, K~19 with PRIMA)
- Is my source small enough?
- Is my source simple enough?
- Is the dynamic range reasonable?
- Do I have a model for my source?
- Do not forget that MIDI and AMBER have spectral resolution (200 resp. 10,000)!

Proposals - Checklist 2



- <http://www.eso.org/instruments/midi/>
- **Check objects against MIDI GTO list**

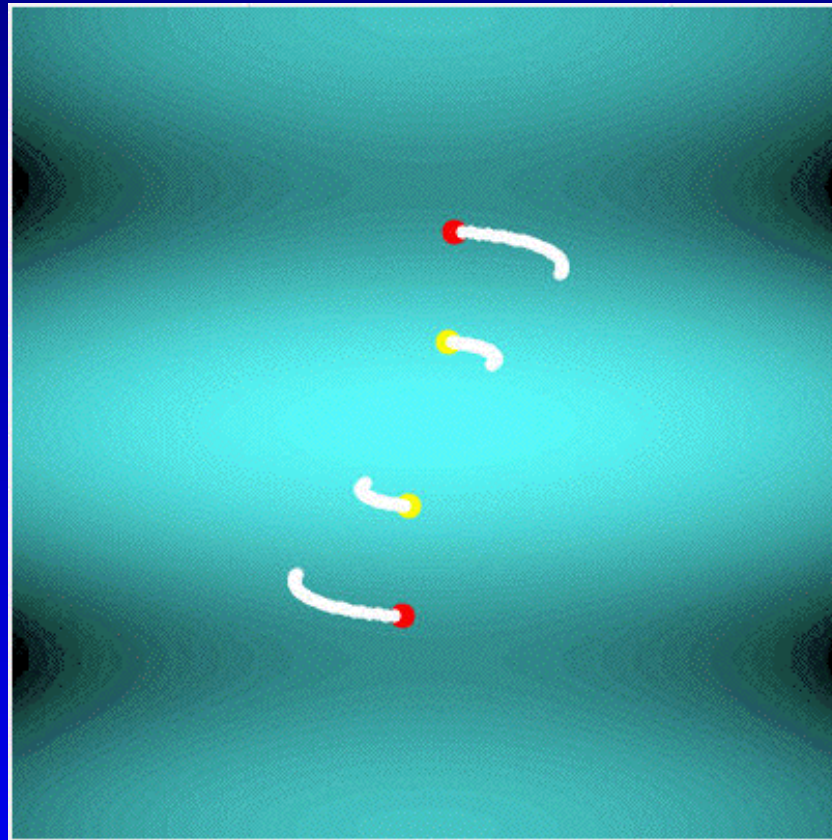
Name	$\alpha(J2000)$	$\delta(J2000)$	Type	z	Dist [Mpc]	$\Delta(1pc)$ [mas]	$S_N(\text{core})$ [mJy]	beam	Immediate Questions	Priority	SD ^a
NGC 1068	02 40 40.7	-00 00 48	S2	0.00379	17.4	11.9	3400	0.2	torus, orientation ?	***	A
NGC 1365	03 33 36.4	-36 08 25	SL8	0.00546	25.2	8.2	610	0.5	torus, size ?	**	
IRS 0518-25	05 21 01.7	-25 22 14	S2	0.0425	196.4	1.0	550	0.5	size ?	**	
MCG-5-23-16	09 47 40.2	-30 56 54	S2	0.00827	38.1	5.4	650	0.5	size, orientation ?	*	
Mrk 1239	09 52 19.1	-01 36 43	S1	0.0199	91.9	2.2	640	0.5	size ?		
NGC 3256	10 27 51.8	-43 54 09	HII	0.00913	42.1	4.9	550	0.5	size ?		
NGC 3281	10 31 52.1	-34 51 13	S2	0.01067	49.2	4.2	620	0.5	size ?	*	
NGC 3783	11 39 01.8	-37 44 19	S1	0.00973	44.9	4.6	590	0.5	size ?	*	B
NGC 5128	13 25 27.6	-43 01 09	RG	0.00182	8.4	24.6	1220	0.5	size, orientation ?	***	
IC 4329A	13 49 19.3	-30 18 34	S1	0.01605	74.0	2.8	350-500	0.5	detectable ?		
Mrk 463	13 56 02.9	+18 22 19	S1	0.0504	232.3	0.9	340	0.5	detectable ?		B
Circinus	14 13 09.3	-65 20 21	S7	0.00145	6.6	31.3	9700	0.5	size, torus ?	***	A
NGC 5506	14 13 15.0	-03 12 27	S2	0.00618	28.5	7.2	910	0.5	size, orientation ?	*	
NGC 7469	23 03 15.6	+08 52 26	S1	0.01631	75.2	2.7	410	0.5	detectable ? size ?		
NGC 7582	23 18 23.5	-42 22 14	S2	0.00539	24.8	8.3	320	0.5	detectable ?		
3C 273	12 29 06.7	+02 03 08	RQ	0.1583	731.0	0.3	350var	0.5	detectable ?	*	
NGC 253 core	00 47 33.1	-25 17 17	LE	0.00080	3.6	57.3	380-1160	0.5	detectable ? size ?	***	
NGC 253 MIR-1 ^b			?	0.00080	3.6	57.3	2040	0.5	size ?	***	

Proposals - Checklist 3



- What is the best baseline: UT2/3, UT2/4, UT3/4? - use VisCalc (<http://www.eso.org/observing/etc/>)
- Do I need low or high dispersion with MIDI (prism/grism)?
- Do I need high accuracy on my visibilities (so called sciphot mode)?
- Is my source brighter than 2Jy at 10mu?
- Is my source brighter than V=16 (STRAP guiding)?
- Visitor or service mode?

VisCalc - Visibility calculator



Service mode



- **Contact point at ESO: User Support Group (USG) - currently Markus Wittkowski and Monika Petr for MIDI (usg-help@eso.org)**
- **Guarantee that top ranked proposals are carried out under optimum conditions**
- **Target line: 50% of all observations in SM**
- **All OBs have to be ready before the start of the period, plus finding charts, README files**

Visitor mode



- **Observer(s) travel to Paranal**
- **No compensation in case of bad weather or technical problems**
- **Visitor mode mandatory for non-standard observations: crowded fields, faint objects, modes not supported in service**
- **Users have to arrive two days before their observations with prepared OBs, backup programs**
- **Users are guided by support astronomers**

Phase 2 preparations - MIDI



- Download p2pp
- Select your calibrators
- Detail your constraints on siderial time
- Define the chopping characteristics
- Write your OBs
- Produce good finding charts at visible and infrared wavelengths
- Write concise READMEs

CalVin - Calibrator selection



No.	Name	R.A. (h,m,s)	Dec. (d,m,s)	Ang. Dist. (deg°)	Ang. Diam. (mas)	Mag_N	Spec. Type	Lum. Class	Qual. Flag	Normalized Visibility ave ± err range	Loss of Correlated Magnitude ave ± err range	RiseTime SetTime Duration	Culmination MaxAltitude	Shadowing
1 (0)	*Target*	6 45 8.90	-16 42 58.00	0.0	6.00 ± 0.00					NOT VISIBLE	NOT VISIBLE	NOT VISIBLE	NOT VISIBLE	NOT VISIBLE
2 (30)	hd48915	6 45 8.92	-16 42 58.00	0.0	6.06 ± 0.13	-1.23	A1	V	1	NOT VISIBLE	NOT VISIBLE	NOT VISIBLE	NOT VISIBLE	NOT VISIBLE
3 (32)	hd50778	6 54 11.40	-12 2 19.10	5.2	3.95 ± 0.22	0.67	K4III	III	1	NOT VISIBLE	NOT VISIBLE	NOT VISIBLE	NOT VISIBLE	NOT VISIBLE
4 (35)	hd61935	7 41 14.83	- 9 33 4.10	15.4	2.26 ± 0.12	1.64	G9III	III	2	NOT VISIBLE	NOT VISIBLE	NOT VISIBLE	NOT VISIBLE	NOT VISIBLE
5 (26)	hd36079	5 28 14.72	-20 45 34.00	18.6	2.97 ± 0.16	0.90	G5II	II	2	0.99 ± 0.001 0.99-0.99 graph ascii	0.01 ± 0.00 0.01-0.01 graph ascii	35.50UT 35.50UT 0.00hrs	35.50 UT max = 17° graph ascii	max = 24% graph ascii
6 (25)	hd35536	5 25 1.74	-10 19 44.00	20.5	2.16 ± 0.12	1.95	K5III	III	2	0.99 ± 0.001 0.99-0.99 graph ascii	0.01 ± 0.00 0.01-0.01 graph ascii	35.00UT 35.50UT 0.50hrs	35.50 UT max = 23° graph ascii	max = 26% graph ascii
7 (24)	hd35369	5 23 56.83	- 7 48 29.00	21.7	1.88 ± 0.09	1.95	G8III	III	2	1.00 ± 0.000 0.99-1.00 graph ascii	0.01 ± 0.00 0.01-0.01 graph ascii	34.75UT 35.50UT 0.75hrs	35.50 UT max = 25° graph ascii	max = 40% graph ascii
8 (27)	hd39400	5 52 26.44	1 51 18.50	22.7	2.39 ± 0.14	1.59	K1.5IIb	IIb	2	0.99 ± 0.001 0.99-0.99 graph ascii	0.02 ± 0.00 0.02-0.02 graph ascii	35.00UT 35.50UT 0.50hrs	35.50 UT max = 21° graph ascii	max = 4% graph ascii
9 (37)	hd65953	8 1 13.33	- 1 23 33.40	24.2	3.05 ± 0.59	1.07	K4III	III	2	0.98 ± 0.009 0.97-0.98 graph ascii	0.05 ± 0.02 0.06-0.05 graph ascii	22.25UT 22.75UT 0.50hrs	22.25 UT max = 22° graph ascii	max = 0% graph ascii

MIDI in P73



- 71 hours of service mode
- 3.5 nights of visitor mode
- 4 nights of GTO

We are waiting for your proposal!