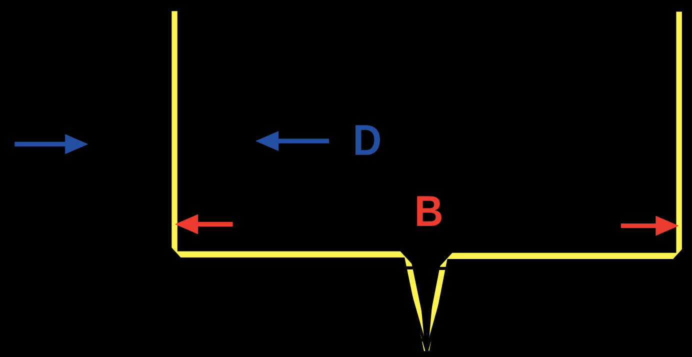
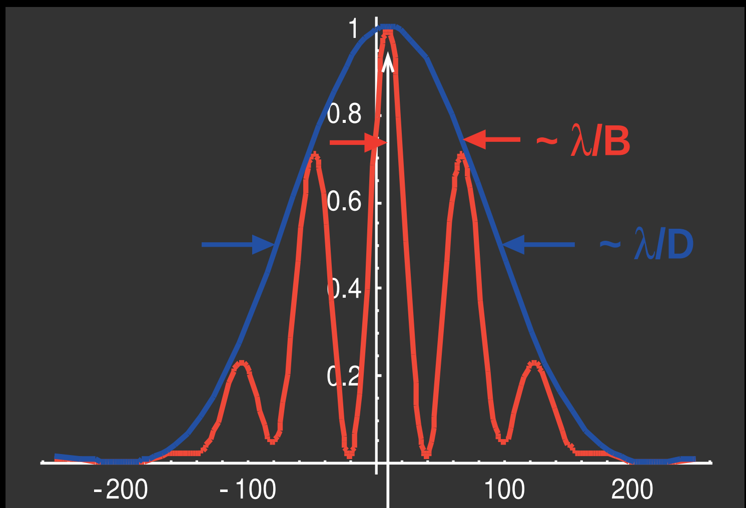
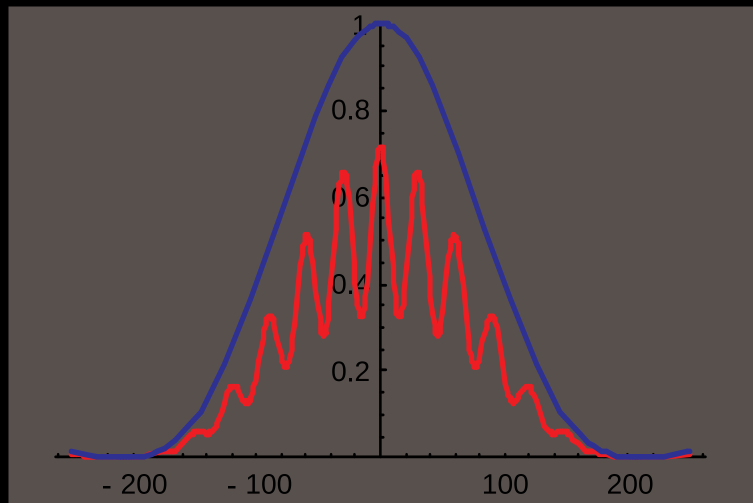
Michelson stellar interferometer

- Stellar source with angular size α_0
- Add fringe patterns (i.e. intensities) between $\pm\alpha_0/2$
- Resulting fringe pattern shows reduced contrast
- Reduced contrast depends on B and on α_0, but also on atmospheric properties and optical and mechanical characteristics.

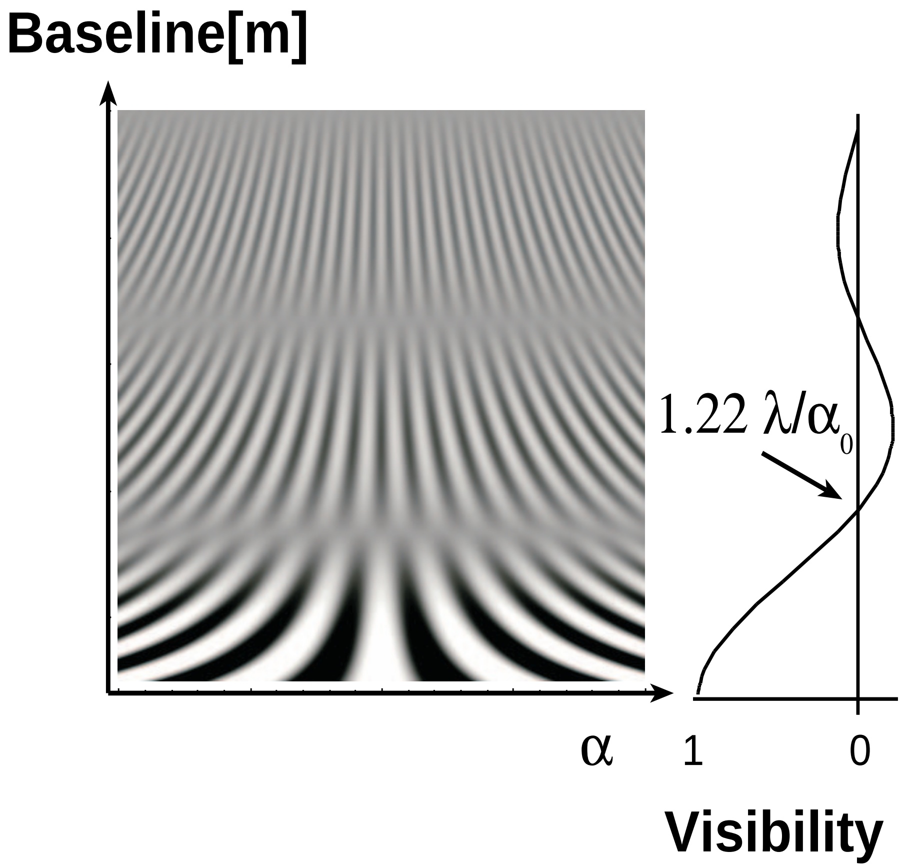






Thanks to A. Glindemann

Visibility Function



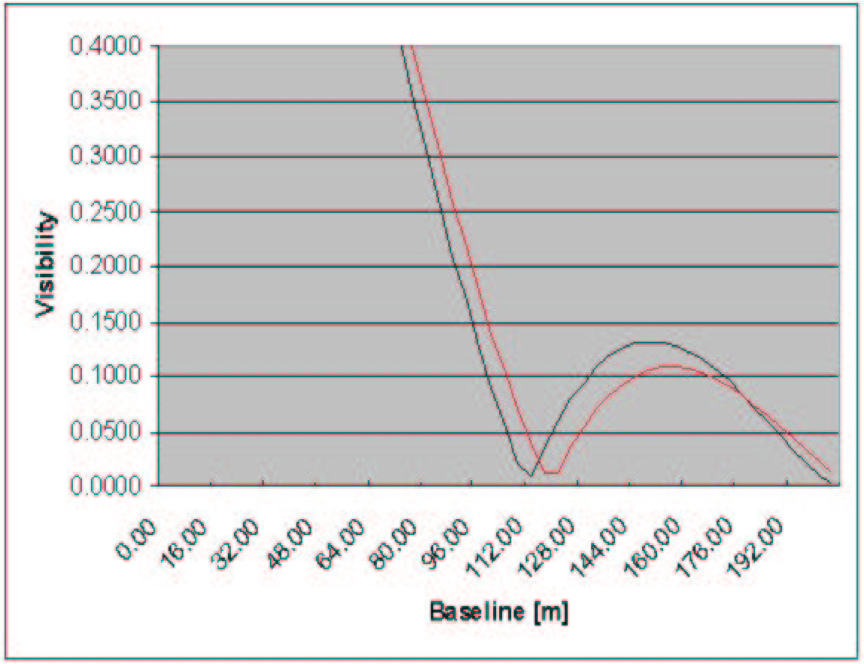
- Analysing the resulting fringe pattern as a function of B and α_0 one finds that Visibility(B) = F(I(α))
- If I(α) = Circ(α/α_0) Vis(B) = Besinc($\pi\alpha_0$ B/λ)

Thanks to A. Glindemann

Examples of visibility functions

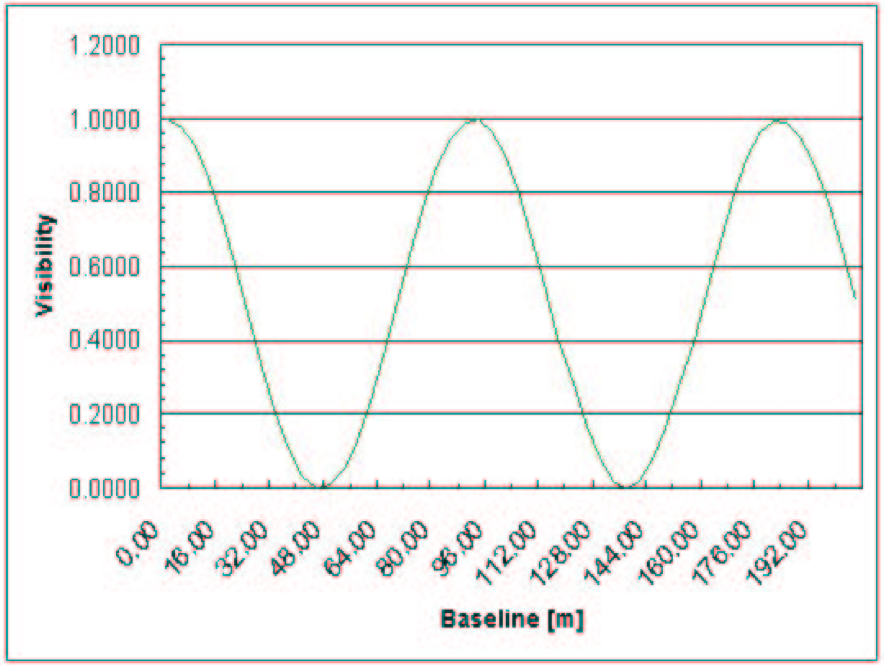
Uniform disk + limb darkening:

(UD diameter 5 milliarcsec)



Binary star:

(separation 5 milliarcsec)



The response of an interferometer

$V_{m,1} = \alpha\, V_{o,1}$

$V_{m,2} = \alpha\, V_{o,2}$

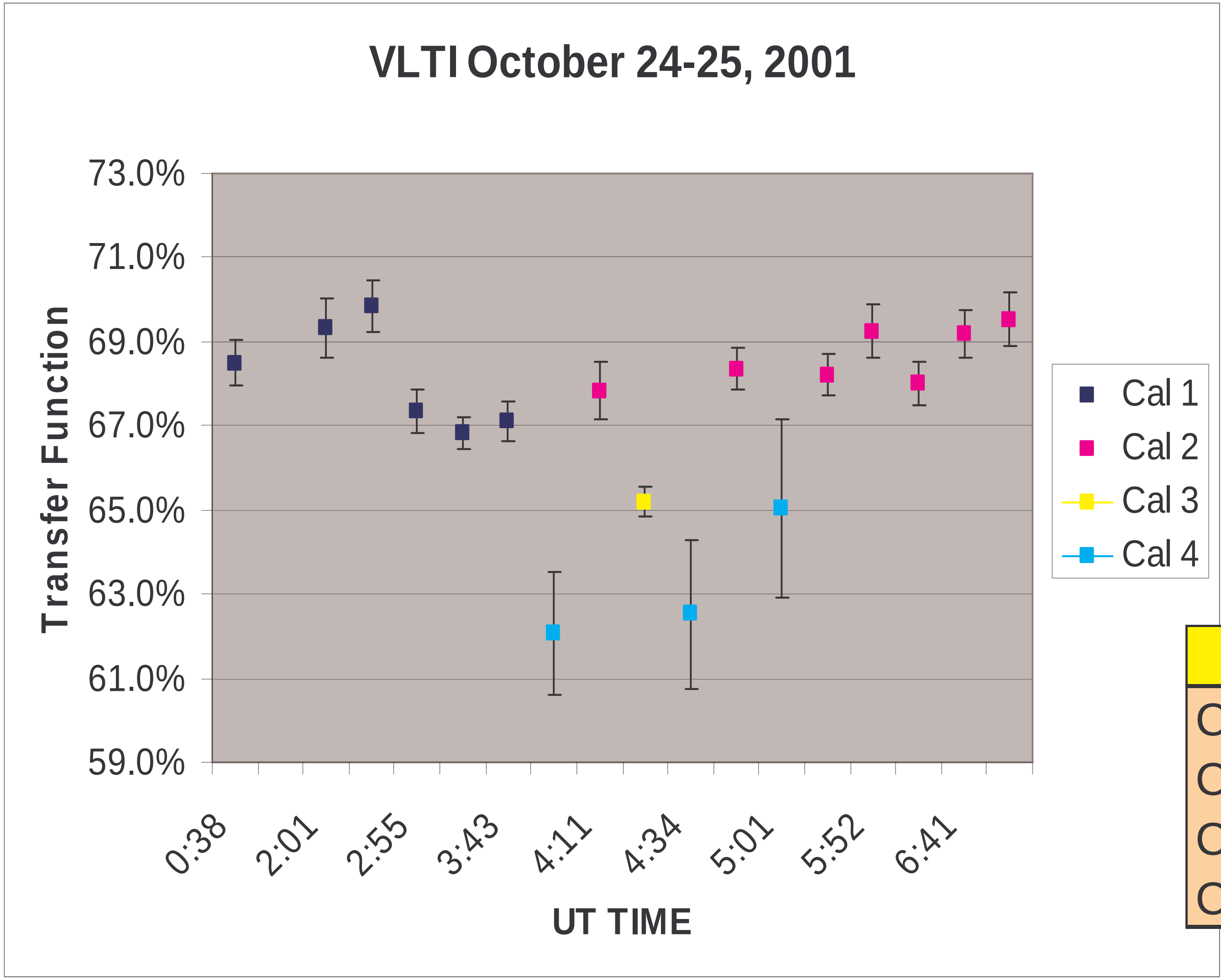
α= Interferometric transfer function

if $V_{o,2}$ is known, then $\alpha = V_{m,2} / V_{o,2}$

$V_{o,1}$ can thus be derived

The factor α can vary with changes in the interferometer and its environment, and with atmospheric conditions. Therefore, it must be measured at the same time and under the same conditions as the object. The final accuracy cannot be better than the accuracy on α, which is in turn dependent on $V_{o,2}$.

Interferometry needs (good) calibrators!



Aver.	67.3%	2.3%
Cal 1 w.m	67.7%	0.2%
Cal 2 w.m.	68.6%	0.2%
Cal 3	65.2%	0.4%
Cal 4 w.m.	62.8%	1.0%

Efforts towards a VLTI Calibrator System

A Brief History

1. Need for calibrators identified. Workpackage set up with NEVEC beginning of 2001.
2. Invitation to partners. VLTI calibrators meetings.
3. Annual report of the ESO/NEVEC WP.
4. CHARM Catalogue created (not a calibrators list, but useful reference).
5. Presence at OHP meeting Summer 2001, IAU Working Group, exchanges also outside ESO community.

1st VLTI Calibrators Meeting

Leiden, 22 June 2001

A. Chelli (JMMC), I. Percheron (NEVEC), A. Richichi (ESO), B. Stecklum (MIDI)

Conclusions

1. Agreed to maintain informative collaboration, but each partner continues to pursue their objectives with their own means.
2. Tentatively agree to merge results into a common catalogue.
3. Request for formal agreements by some partners.

The CHARM Catalogue

Catalogue of High Angular Resolution Measurements

Richichi & Percheron A&A 386, 492 (2002)
Available at CDS, Vizir J/A+A/386/492

Summary

1. Collect angular measurements at high angular resolution by the techniques of Lunar Occultations, Long-Baseline interferometry. Also indirect estimates. A few sparse measurements by other methods.
2. Include angular diameters, binary stars, circumstellar components
3. Designed for on-line use (based on Excel), Interferometry applications.

3248 entries for 2094 independent stars (2432/1625 in the A&A paper).

Distributed on CD-Rom.

New release in the course of summer 2003.

Note that CDS shows estimated diameters first.

2nd VLTI Calibrators Meeting

Florence, 10-11 June 2002

D. Bonneau (JMMC), I. Percheron (NEVEC/MIDI/FRINGE), R. Petrov (AMBER/JMMC), A. Richichi (ESO), L. Testi (AMBER), M. Wittkowski (ESO)

Conclusions

1. MW will represent the ESO and the partners that participated in this discussion, at the round table on calibrators that is planned for SPIE2002 in August. ✓
2. AMBER clarifies its position wrt JMMC. LT will try to push for some AMBER manpower devoted to the calibrators needs.
3. At the next EuroInterferometry Meeting, a request will be discussed for a formal homogeneous agreement on the subject of calibrators between ESO and all other partners.
4. A format of the WEB page will be discussed and provided to DMD before August 2002 ✓
5. A student will work for 2 months at ESO under the supervision of AR to explore the possibility of deducing seeing/coherence parameters from the VINCI PA,PB signals ✓
6. Experiment on the effect of filtering VINCI data according to 0.3<seeing<0.8 (for example), or other quality filters. ✓
7. Study the criteria for optimal fitting of TF to a night of calibrators data ✓

Format for a calibrators list

1. NAME
2. COORD
3. Proper Motions
4. Epoch
5. Primary/Secondary flag
6. Mag. Fields (V,R,J,H,K,L,M,N,Q) Empty when not available
7. Sp. Type
8. Diam. and Error (wavelength-independent)
9. Parameters to compute on-line a wavelength-dependent value of the diameter. Suggestions are: Teff, log g, z
10. Other useful values: V_sini (phase calibrators), V_rad (spectr. calibrators), parallax, mass
11. Instrument/mode flag. This flag will consist of several fields, each for an instrument/mode combination (Examples: AMBER-K-HR, MIDI-grism...). A calibrator will be good for all modes, unless some of these fields are flagged.
12. Link to a detailed file (for example, named after the source) with references and a history of changes done on the entries.

On-line Calibrators Selection: Calvin

8 calibrators found

ASCII file format - the first column is the universal time

Comparative graphs for target (red) and 7 calibrators:- Normalized Visibilities Correlated Magnitudes Target Altitudes Shadow

No.	Name	R.A. (h m s)	Dec. (d m s)	Ang. Dist. (deg°)	Ang. Diam. (mas)	Mag. K	Normalized Visibility ave ± err range	Correlated Magnitude ave ± err range	RiseTime SetTime RiseDuration	CulminationTime MaxAltitude graph=Targ&Sun	Shadowing
1 (0)	*Target*	6 45 8.9172	-16 42 58.0173	0.0000	6.00		0.48 ± 0.00 0.44-0.60 graph ascii	1.61 ± -0.00 1.80-1.11 graph ascii	23.50UT 32.00UT 8.50hrs	26.75 UT max = 81° graph ascii	max = 13% graph ascii asciiDetailed
2 (33)	alfcmaa	6 45 8.9000	-16 42 58.0000	0.0001	5.60	-1.40	0.53 ± 0.02 0.49-0.64 graph ascii	1.37 ± 0.08 1.53-0.96 graph ascii	23.50UT 32.00UT 8.50hrs	26.75 UT max = 81° graph ascii	max = 13% graph ascii asciiDetailed
3 (38)	tetcma	6 54 11.4000	-12 2 19.0000	3.9828	4.13	0.70	0.72 ± 0.05 0.70-0.77 graph ascii	0.71 ± 0.14 0.78-0.57 graph ascii	23.50UT 32.00UT 8.50hrs	26.75 UT max = 77° graph ascii	max = 0% graph ascii asciiDetailed
4 (39)	delcma	7 8 23.5000	-26 23 35.5000	11.6658	3.29	0.40	0.82 ± 0.05 0.80-0.90 graph ascii	0.43 ± 0.11 0.49-0.24 graph ascii	23.50UT 32.50UT 9.00hrs	27.00 UT max = 88° graph ascii	max = 21% graph ascii asciiDetailed
5 (41)	kqpup	7 33 48.0000	-14 31 26.0000	11.9177	5.60	0.10	0.53 ± 0.08 0.49-0.63 graph ascii	1.37 ± 0.31 1.53-1.02 graph ascii	23.50UT 32.75UT 9.25hrs	27.50 UT max = 79° graph ascii	max = 3% graph ascii asciiDetailed
6 (32)	dellep	5 51 19.3000	-20 52 44.7000	13.4098	2.57	1.37	0.89 ± 0.00 0.87-0.93 graph ascii	0.26 ± 0.01 0.29-0.17 graph ascii	23.50UT 31.25UT 7.75hrs	25.75 UT max = 86° graph ascii	max = 44% graph ascii asciiDetailed
7 (46)	6pup	7 49 41.2000	-17 13 42.3000	15.5741	1.83	2.24	0.94 ± 0.00 0.93-0.96 graph ascii	0.13 ± 0.01 0.15-0.10 graph ascii	23.50UT 33.00UT 9.50hrs	27.75 UT max = 82° graph ascii	max = 6% graph ascii asciiDetailed
8 (45)	hr3014	7 46 2.1900	-6 46 21.0000	18.0227	1.78	2.43	0.95 ± 0.00 0.94-0.95 graph ascii	0.12 ± 0.00 0.14-0.11 graph ascii	23.50UT 32.75UT 9.25hrs	27.75 UT max = 72° graph ascii	max = 0% graph ascii asciiDetailed
9 (44)	1pup	7 43 32.4000	-28 24 39.0000	18.2997	3.80	0.80	0.77 ± 0.05 0.74-0.88 graph ascii	0.57 ± 0.12 0.66-0.29 graph ascii	23.50UT 33.25UT 9.75hrs	27.75 UT max = 85° graph ascii	max = 44% graph ascii asciiDetailed

3rd VLTI Calibrators Meeting

Garching, 30-31 January 2003

Objectives

- Present the work of ESO, both compilative and observational (VLTI).
- Get input from instrument teams for specific needs.
- Exchange of ideas with other interferometric groups.
- Provide a forum for prospective users.
- Present tools for proposal/OB preparation.
- Make a first list of VLTI calibrators public.