
PIONIER

as a community instrument

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AGENCE NATIONALE DE LA RECHERCHE
ANR

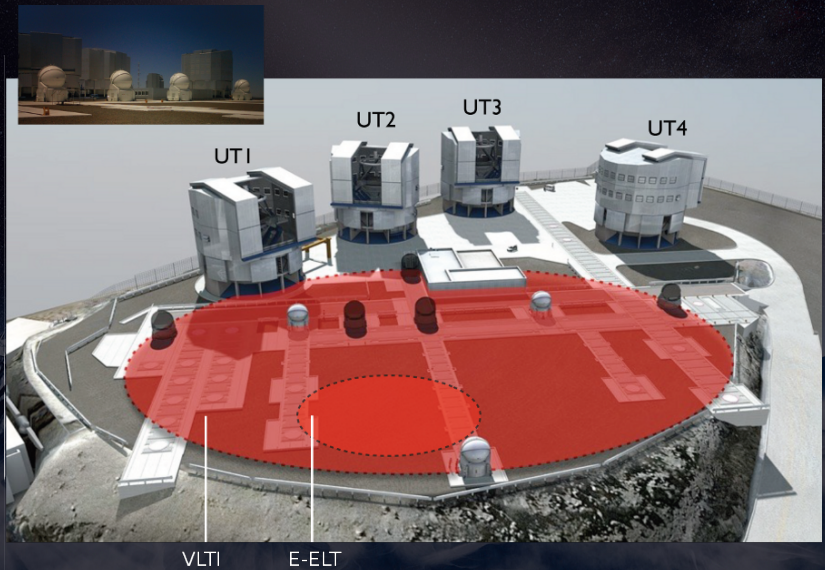


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Jacques Kluska
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Hugues Sana

A graphic element for the IPAG logo, featuring several blue circles of varying sizes and a white curved line that sweeps across the scene.

IPAG
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VLT/PIONIER



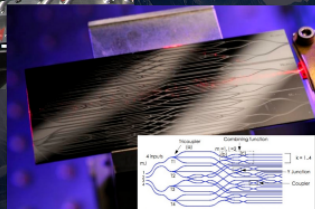
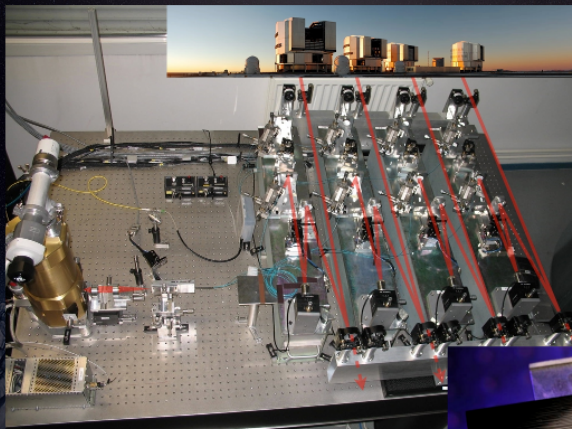
Why PIONIER?

Precision Integrated Optics Near Infrared Experiment

Instrument	Available	# Tel.	Band	V^2 accuracy
MIDI	2003	2	<i>N</i>	5%
AMBER	2006	3	<i>(J), H, K</i>	5–10%
PIONIER	2010	4	<i>H, (K)</i>	1%
GRAVITY	2016	4	<i>K</i>	~1%
MATISSE	2017	4	<i>L, M, N</i>	few %

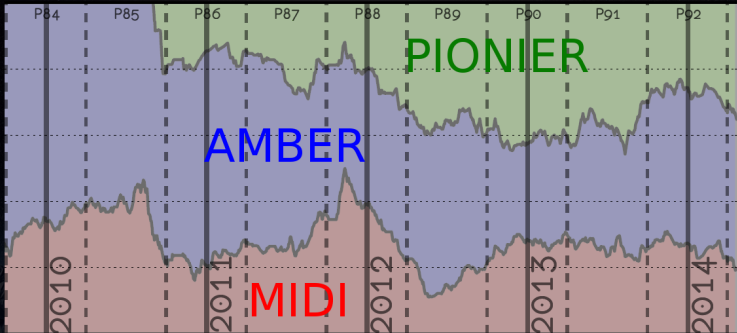
- ☞ Visitor instrument for VLT
- ☞ Have a 4-telescope combiner available in < 2 years
- ☞ Low budget: 200.000 EUR + man power + used detector (now upgraded)
- ☞ Experience with integrated optics beam combiner

VLTI/PIONIER



VLTI/PIONIER

Fraction of VLTI time



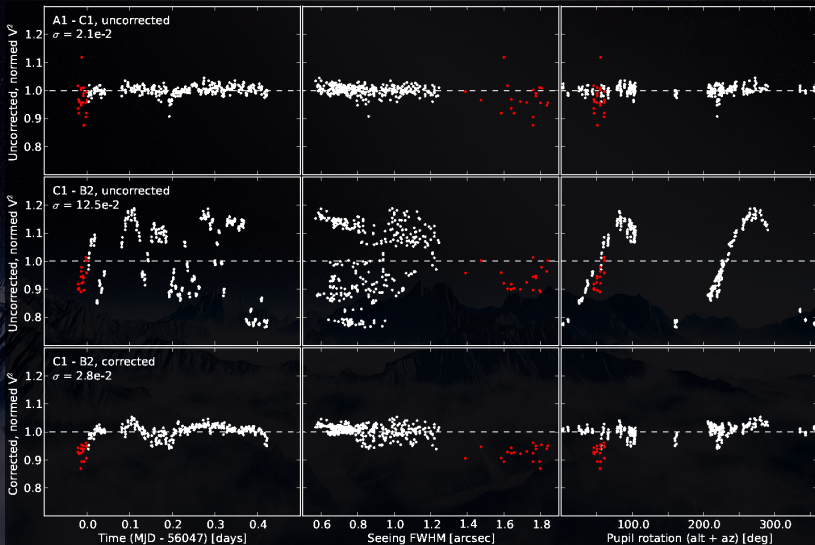
Statistics: Mérand et al. (2014)

P96: **73% PIONIER**, 27% AMBER (MIDI gone)

So, what can it do?

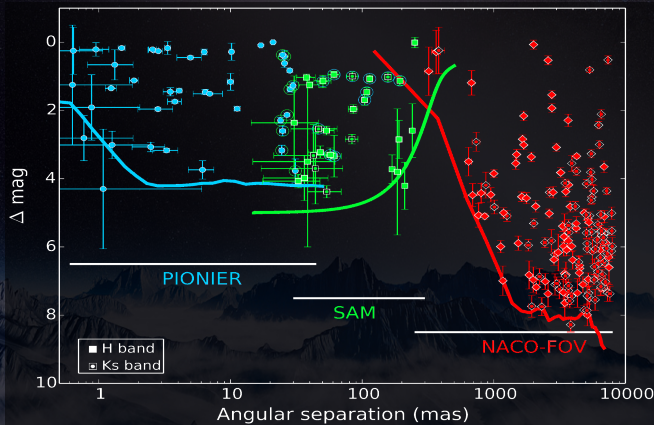
- ☞ *H* band, 6 spectral channels
- ☞ Accuracy on single $V^2 \sim 1\%$ with ATs, worse with UTs (vibrations)
- ☞ Limit: $H \sim -1 \dots 8$ in service mode
- ☞ Minimum $V \sim 5\%$ ($\sim 1\%$ with baseline bootstrapping)
- ☞ High cadence (as fast as 6 min per OB!)
⇒ surveys, imaging
- ☞ Extremely fast, robust against conditions (new detector!)
- ☞ **Now available as community instrument!**

But: a calibration issue



Recent science highlights

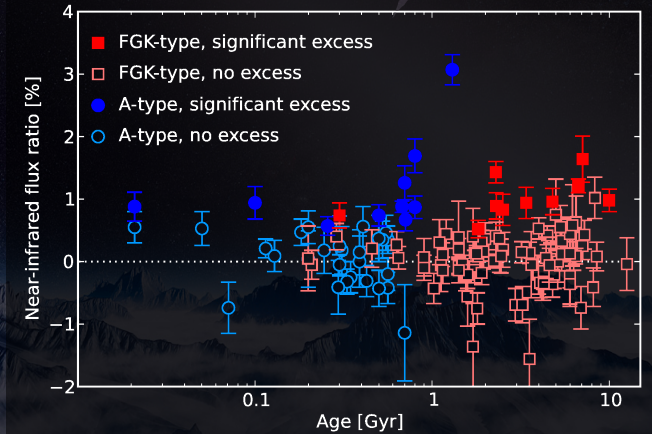
Large surveys



Survey for multiplicity of O-type stars
117 stars observed with PIONIER (Sana et al. 2014)

Recent science highlights

Large surveys



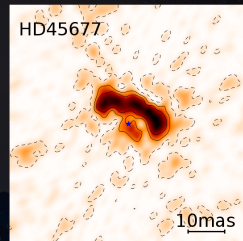
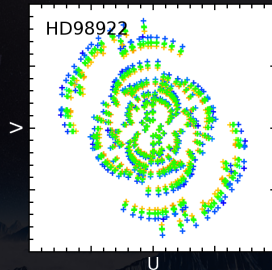
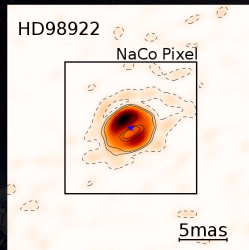
Survey for exozodiacal dust disks (1% disk-to-star flux ratio)
94 stars observed with PIONIER (Ertel et al. 2014)

Other surveys

- ☞ Multiplicity of main sequence stars (A to K)
Marion et al. (2014), exozodi sample
- ☞ Herbig AeBe star disks
Lazareff et al. in prep., 55 targets
- ☞ Scattered light in T Tauri disks
Anthonioz et al. (2014), 21 targets

Recent science highlights

Imaging of disks



Full use of the VLTI arrays, high cadence (u-v-coverage)
Star subtracted images (Kluska et al. 2014)

Recent science highlights

Imaging of disks

Proprietary
Data

(shown in the talk but not to
appear online)

Another example: Post-AGB binary disk (Hillen et al., in prep.)
New detector was critical for success!

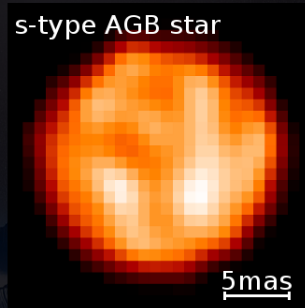
Recent science highlights

Imaging photospheres of evolved stars

C rich Mira AGB star



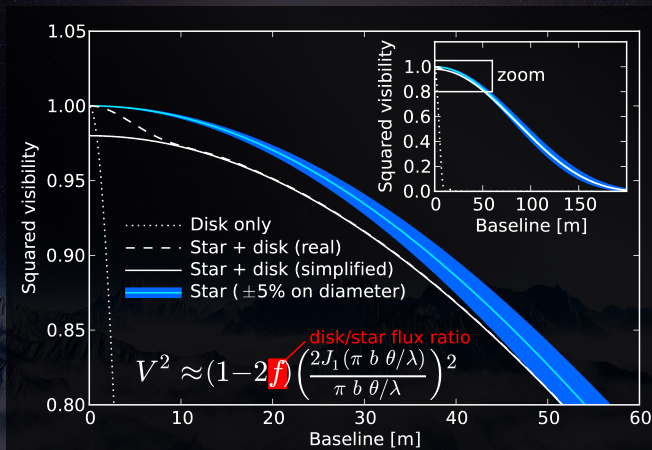
s-type AGB star



Variable structure, all arrays in short time
(Paladini et al. in prep.)

Recent science highlights

High contrast disk search

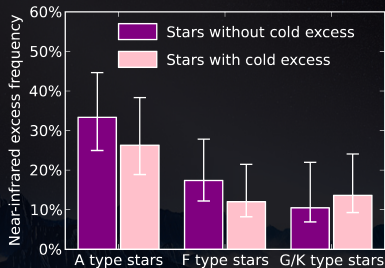
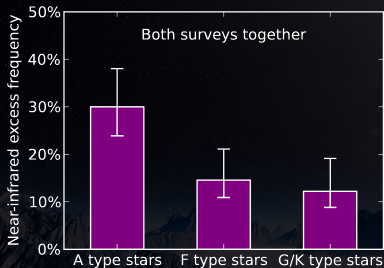


Detection of faint exozodiacal dust

High V^2 accuracy & cadence needed (Ertel et al. 2014)

Recent science highlights

High contrast disk search



Just one example of the statistical constraints
For all statistics see Ertel et al. (2014)

Thanks a lot!

