



# SPHERE

Direct imaging of extra-solar planets

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## Limitations of indirect detections

### ☀ Radial Velocity

- ☀ Detection sensitive to orbit inclination
- ☀ Indetermination on the planet mass
- ☀ Studies limited to Solar type stars or cool stars.  
Preferably non active stars
- ☀ Need for long observing periods

### ☀ Photometric transits

- ☀ Very sensitive to inclination
- ☀ Close planets, large radii

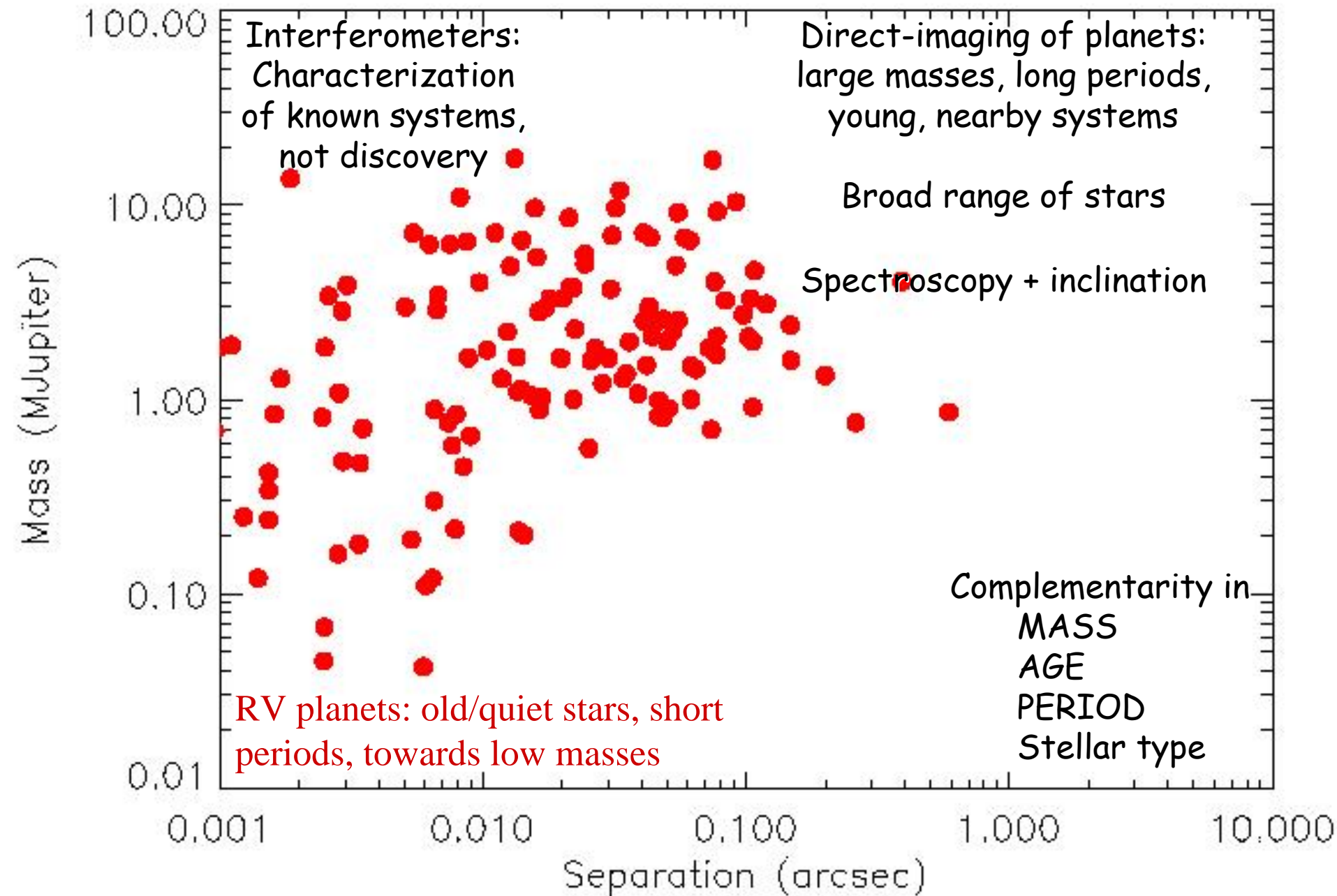


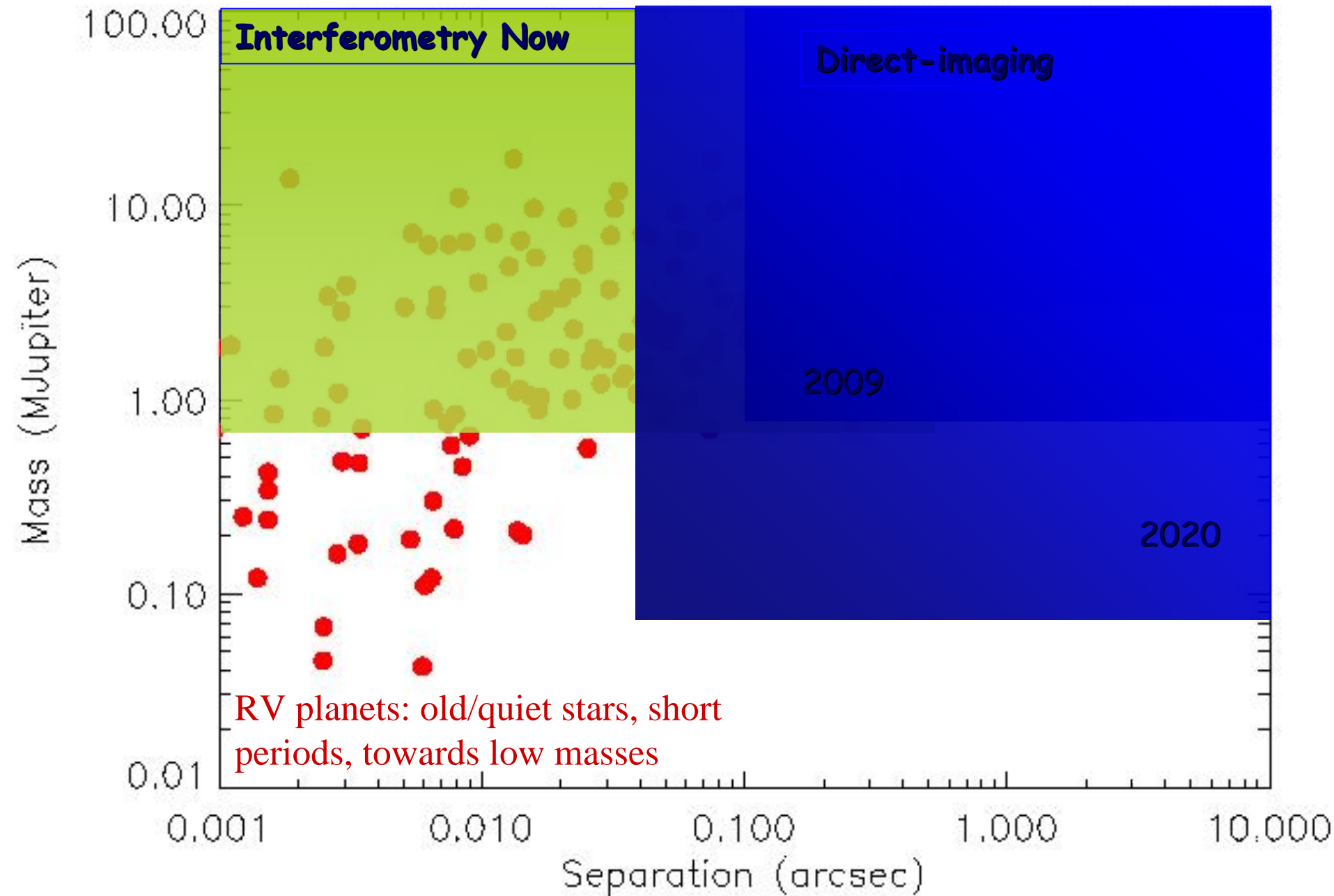
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## Imaging of extra-solar planets

- ☀ Rapid identification of the planet
- ☀ Determination of the orbit, no  $M \cdot \sin(i)$  ambiguity
- ☀ Characterization of the planet
  - ☀ albedo, temperature, chemical composition
  - => test of atmospheric models, of evolutionary models
- ☀ Access to a new (separation, age) domain
  - ☀ Planets around young stars
  - ☀ Larger separations ( $P > \text{few years}$ )
- ☀ Access to *all* types of stars
  - ☀ Early type stars
  - ☀ Active stars

But ... difficult !





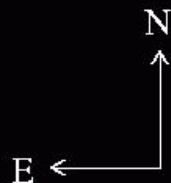
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And we have results now!

2MASSWJ 1207334-39325



$\Delta = 0.77''$



VLT/NACO

GQ Lupi

ESO VLT NACO June 2004

A

b

Extremely young  $\sim M_J$  planets

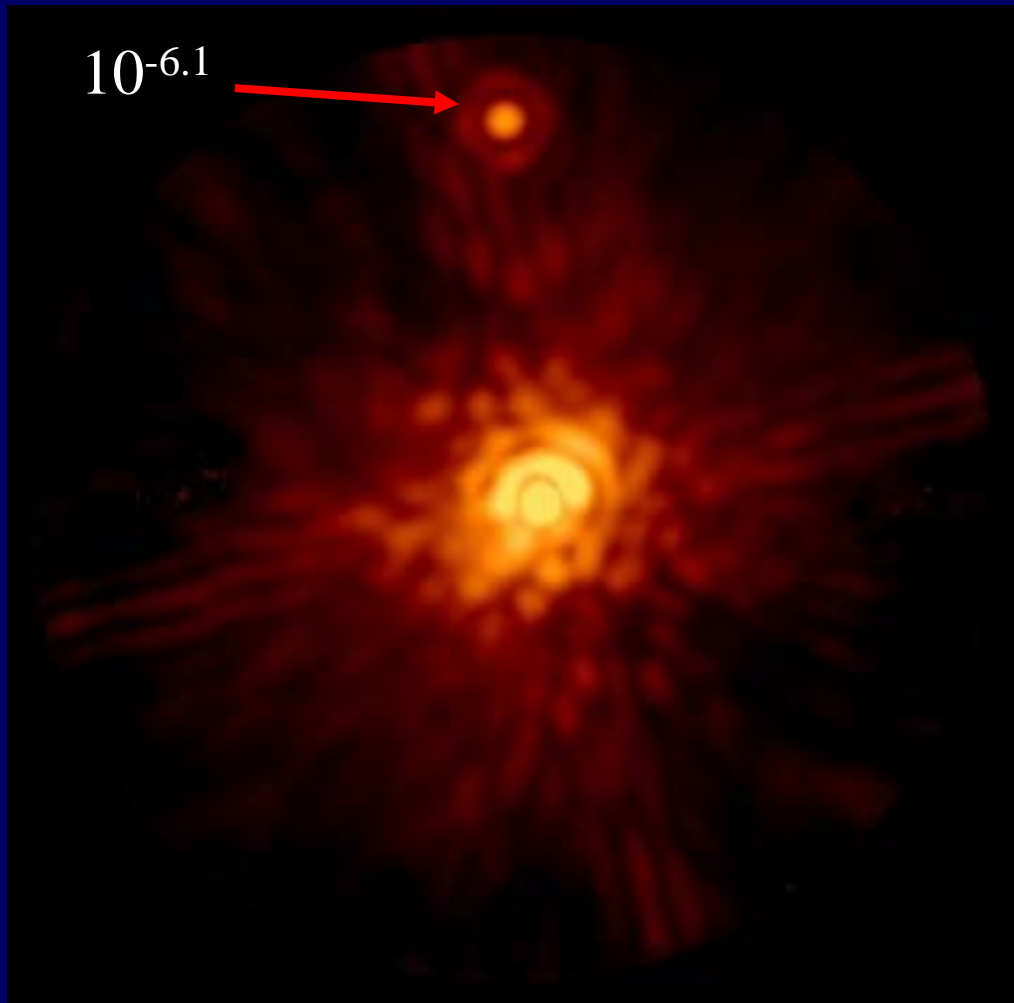
Science Vision - Poitiers January 2007

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## Some Nearby Star

H-Band  
15 minute exp.

$10^{-6.1}$



Requirements:  
EGP:  $10^{-6}/10^{-8}$   
Earth:  $10^{-9}/10^{-10}$

Facilities:  
VLT-ELT + XAO  
Space

5"

Weird colors  
(I, z, J, H, K)

Companionship  
not confirmed

Courtesy  
B. Oppenheimer  
LYOT project