MonteCarlo simulations developed for SPHERE

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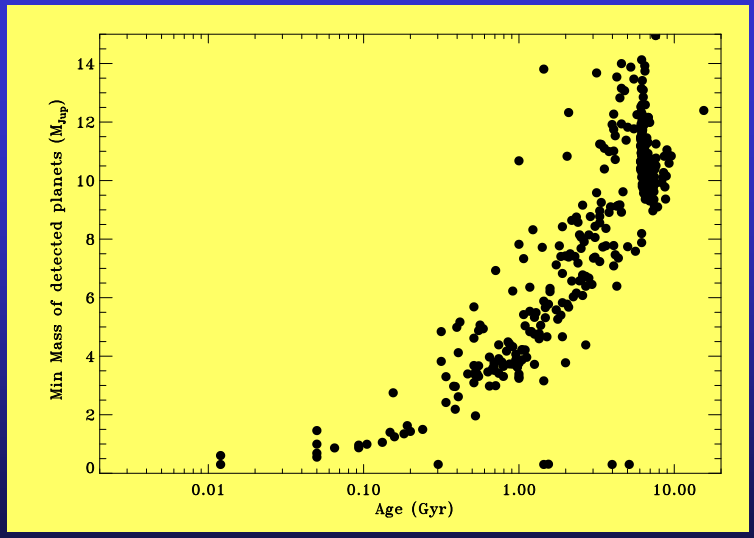


Large list of real targets with properties of each star

Montecarlo generation of orbital elements and mass according to distribution of giant planets from RV survey

Derivation of luminosity contrast (intrinsic + reflected light) depending on stellar and planet parameters

Evaluation of detectability for each generated planet

Parameters of the simulation for ELT

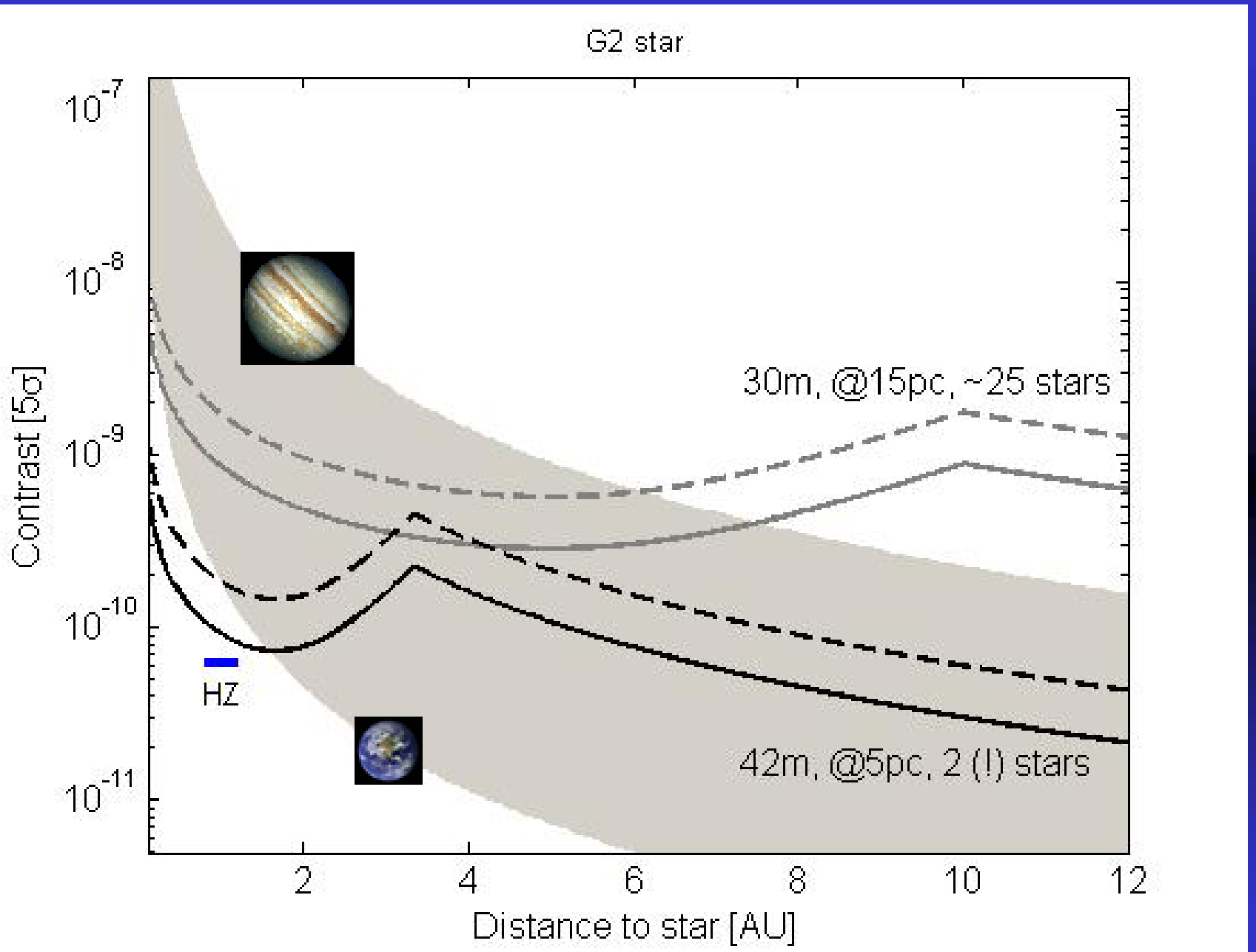
Sample: Hipparcos stars with d<20 pc observable with SPHERE

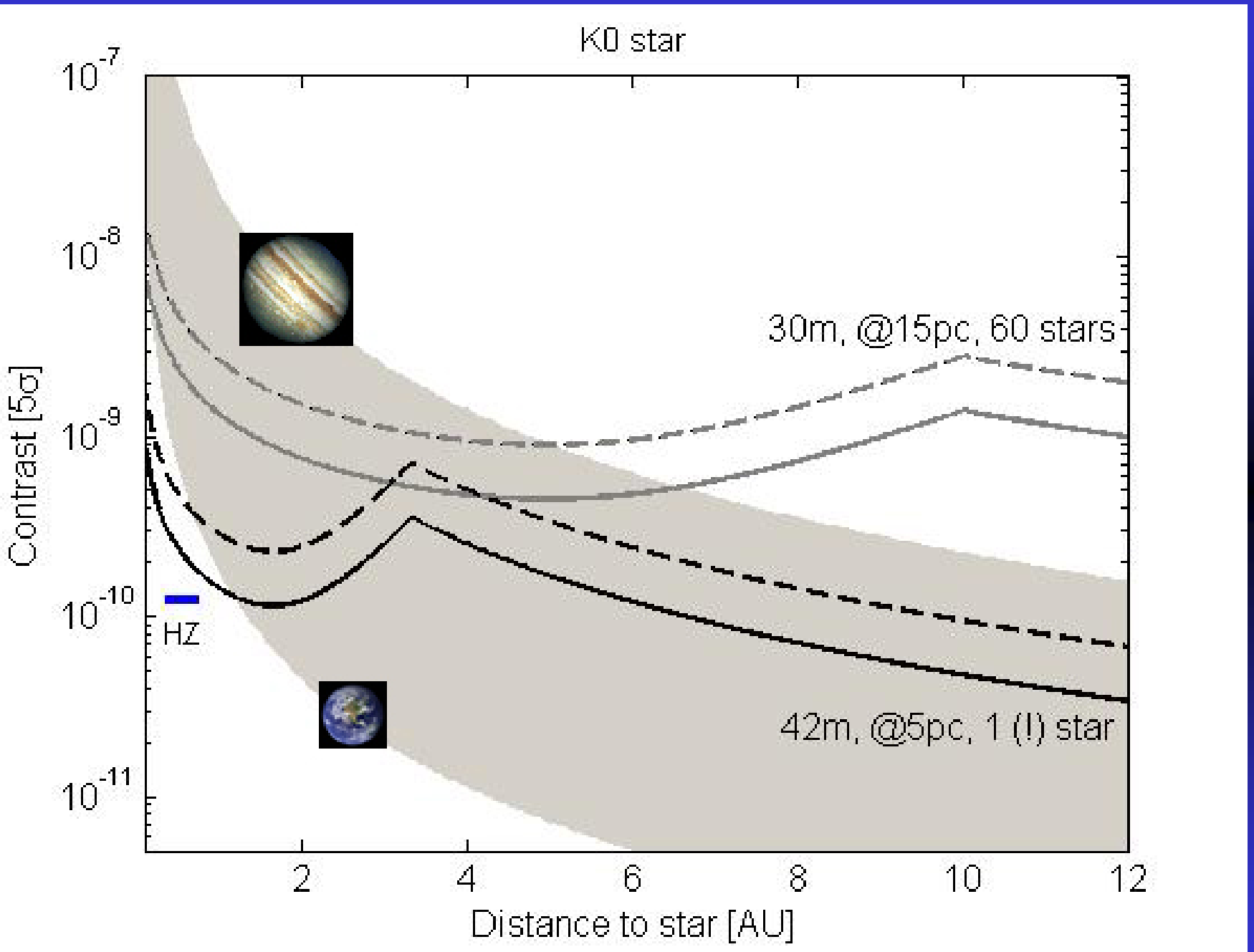
Minimum mass of generated planets: 1 Mearth

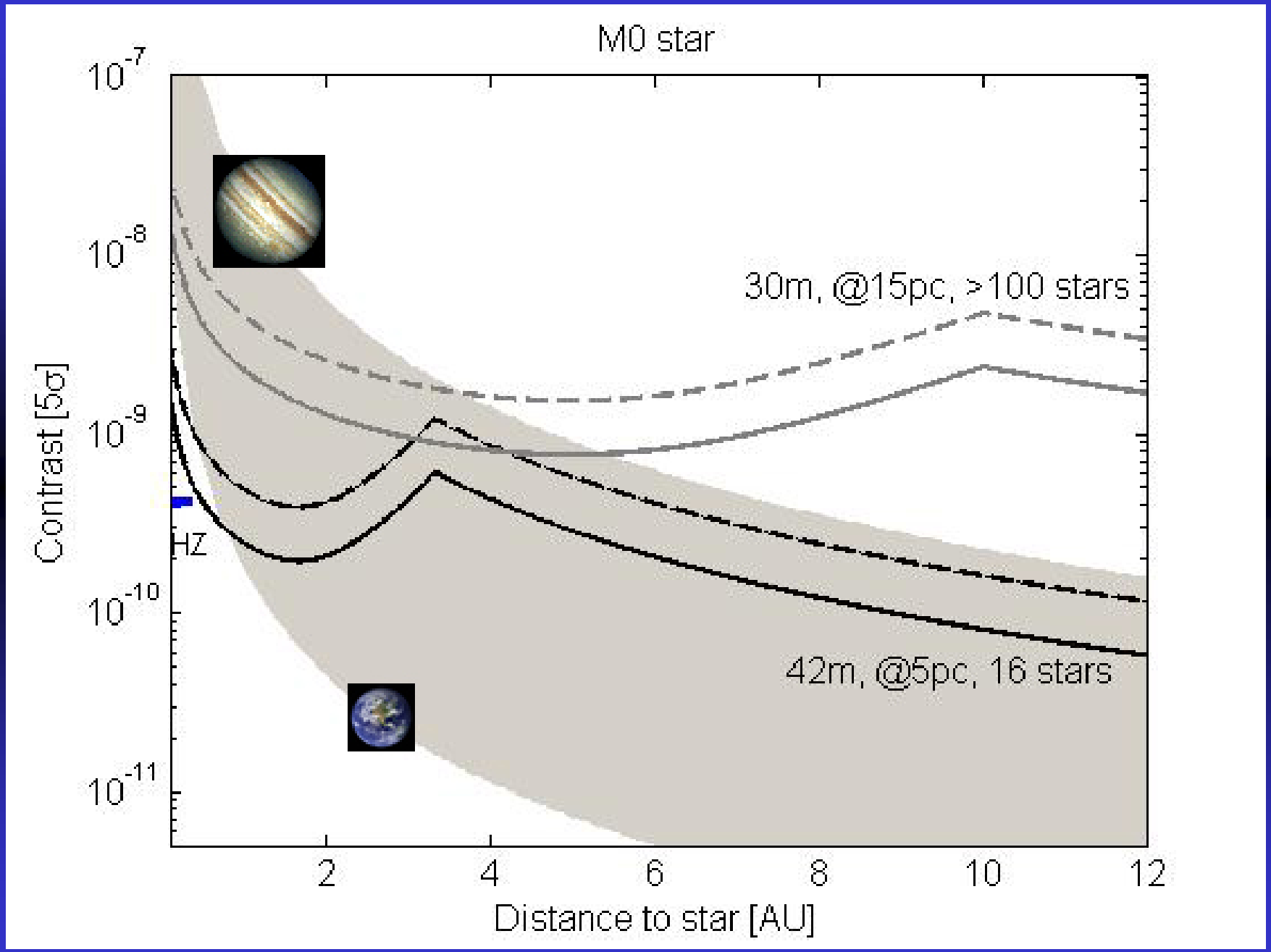
Mass-radius relation of solar system planets

Jupiter albedo for all planets

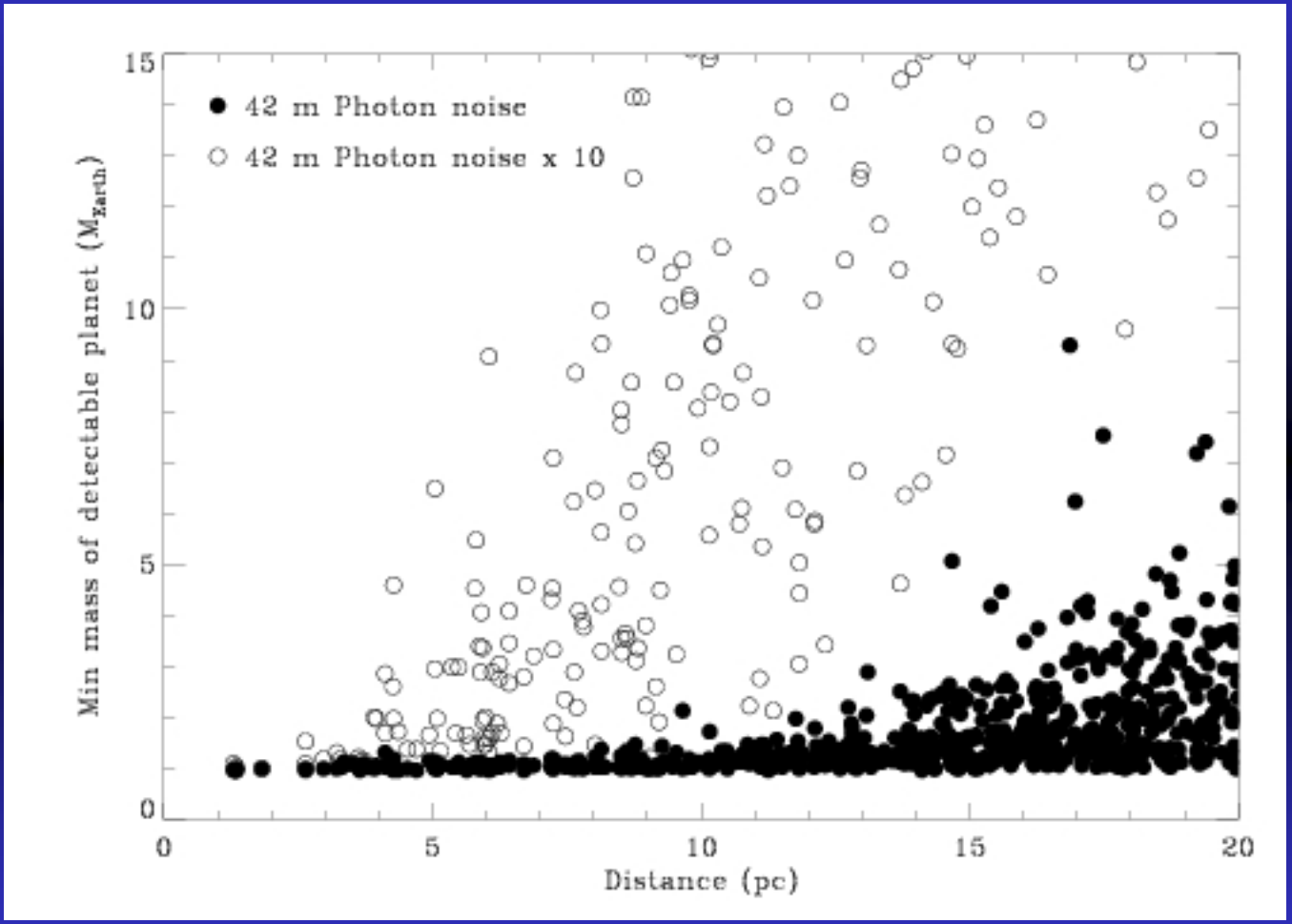
Inner working angle: 0.05 arcsec 42 m, 0.07 arcsec 30 m


G2 star
Contrast [5σ]
10^-7
10^-8
10^-9
10^-10
10^-11
30m, @15pc, ~25 stars
HZ
42m, @5pc, 2 (!) stars
2
4
6
8
10
12
Distance to star [AU]


K0 star
Contrast [5σ]
Distance to star [AU]
30m, @15pc, 60 stars
42m, @5pc, 1 (!) star
HZ


M0 star
Contrast [5σ]
Distance to star [AU]
30m, @15pc, >100 stars
42m, @5pc, 16 stars
HZ
10^-7
10^-8
10^-9
10^-10
10^-11
2
4
6
8
10
12

42 m photon noise only vs photon noise x 10



Next steps

- Estimate of possible numbers of detectable planets depending on the frequency of terrestrial planets
- Optimization of the code for terrestrial planets and ELT
- Comparison between 30 m and 42 m

Needs

- Detectability relations (e.g. Δmag(rho, stellar mag))
- Instrument parameters (band, FoV, mag. limit for AO)