SASP@STScI

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THE **PLATO** MISSION SIMULATOR

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PLATO:
PLAnetary Transits and Oscillations of stars

M-class ESA mission

Space-Based Satellite: ≈32 telescopes (D~6cm)

FoV ~ 1800 sq. degree
(~ 40 ° x 40 °)

time sample < 30s

3yrs
monitored single field
+ 2yrs
monitored single field (different from the first)

+ 2yrs
'step & stare' phase

SCIENTIFIC OBJECTIVES

Simultaneous detection and characterization of exoplanetary systems (transits)

↓

Terrestrial planets in habitable zone

Asteroseismology of bright stars

↓

Better precision on M_*, R_*,t_*

↓

Better M_p, R_p, P, a, ρ_*,ρ_p

Exoplanets search → earth-size

↓

noise ≤ 80 ppm/hr → detection of a Earth-like planet transiting solar-like star

noise ≤ 27 ppm/hr → characterization of transit shape (necessary 8-9 points across the transit)

PLATOSim

time-serie CCD images simulator

Wolfgang Zima
Instituut voor Sterrenkunde - University of Leuven

Images number, telescopes number (only statistical...)

CCD parameters
(px-scale, px-size, SubImage, CCD-size, noise...)

Stellar field
(catalogue, RA and DEC center ...)

(Zima et al. 2010, De Sitter et al. 2006)

PLATOSim

time-serie CCD images simulator

Jitter model
(Attitude Control System movements)

PSF (input)

Sky + Cosmic

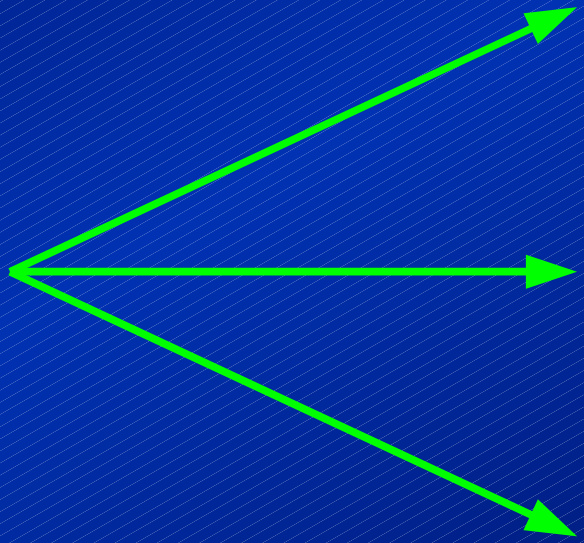
also...Photometric algorithm: simple aperture, weighted mask

Still in development....

(Zima et al. 2010, De Sitter et al. 2006)

PROBLEM: **crowding effect**

Simulations



CARINA field

Sparse, ≈7000 stars
(center RA=154°, DEC=-71°)

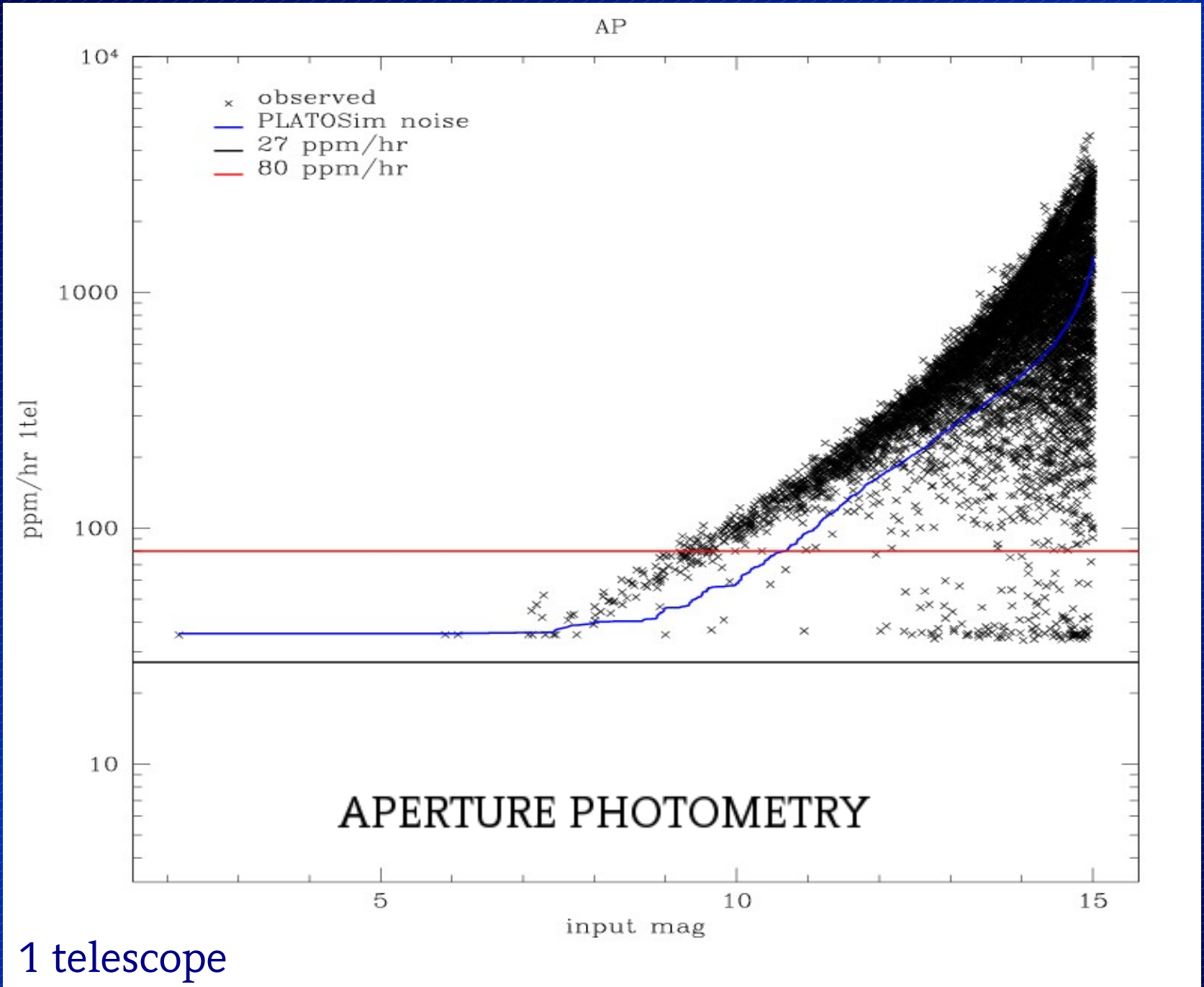
Medium, ≈22000 stars
(center RA=181°, DEC=-68°)

Dense, ≈33000 stars
(center RA=197°, DEC=-60°)

1°.25 x 1°.25

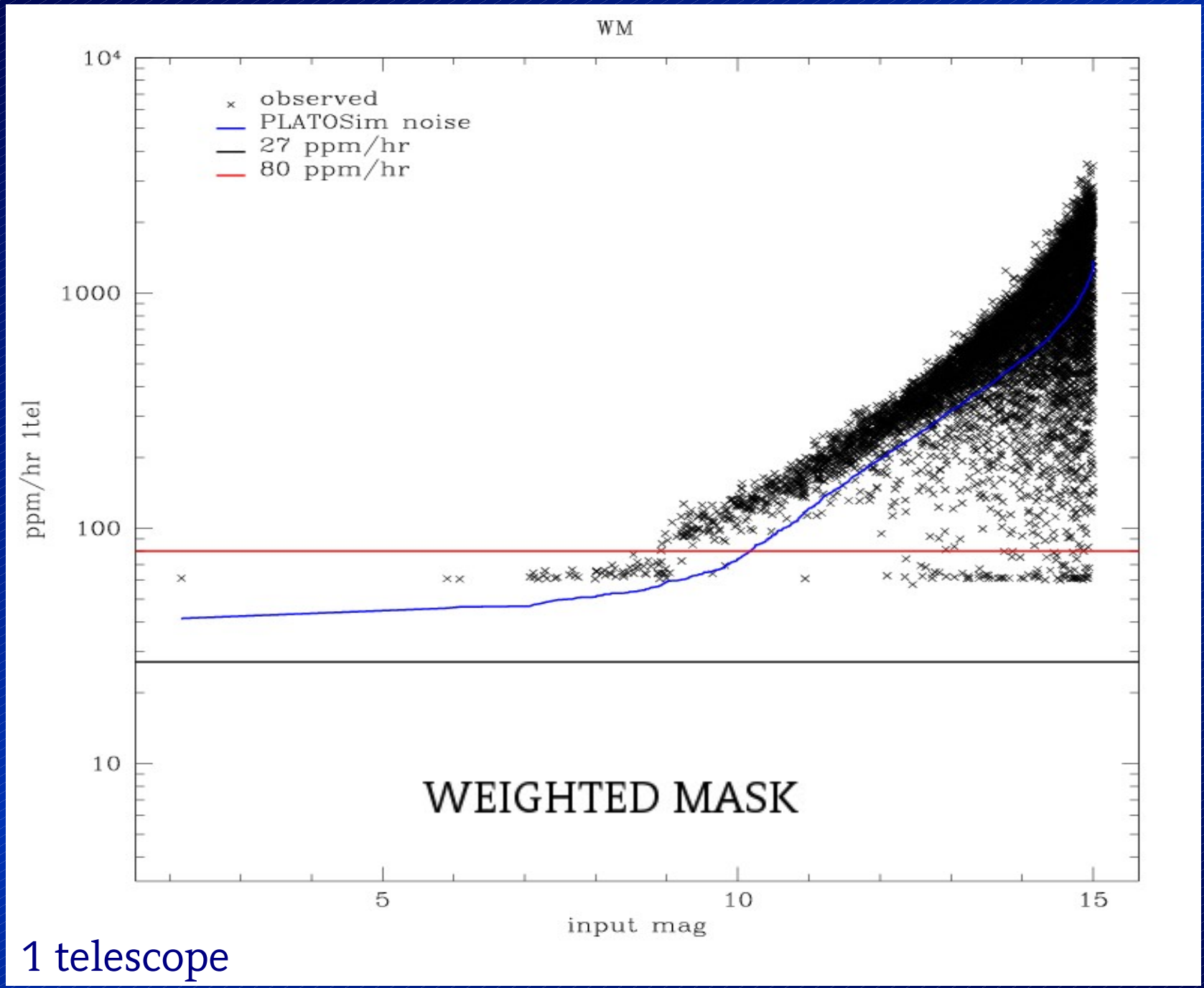
Input mag brighter than 15 mag

Simulation: 100 images (exposure=21.84s), sparse field, no jitter



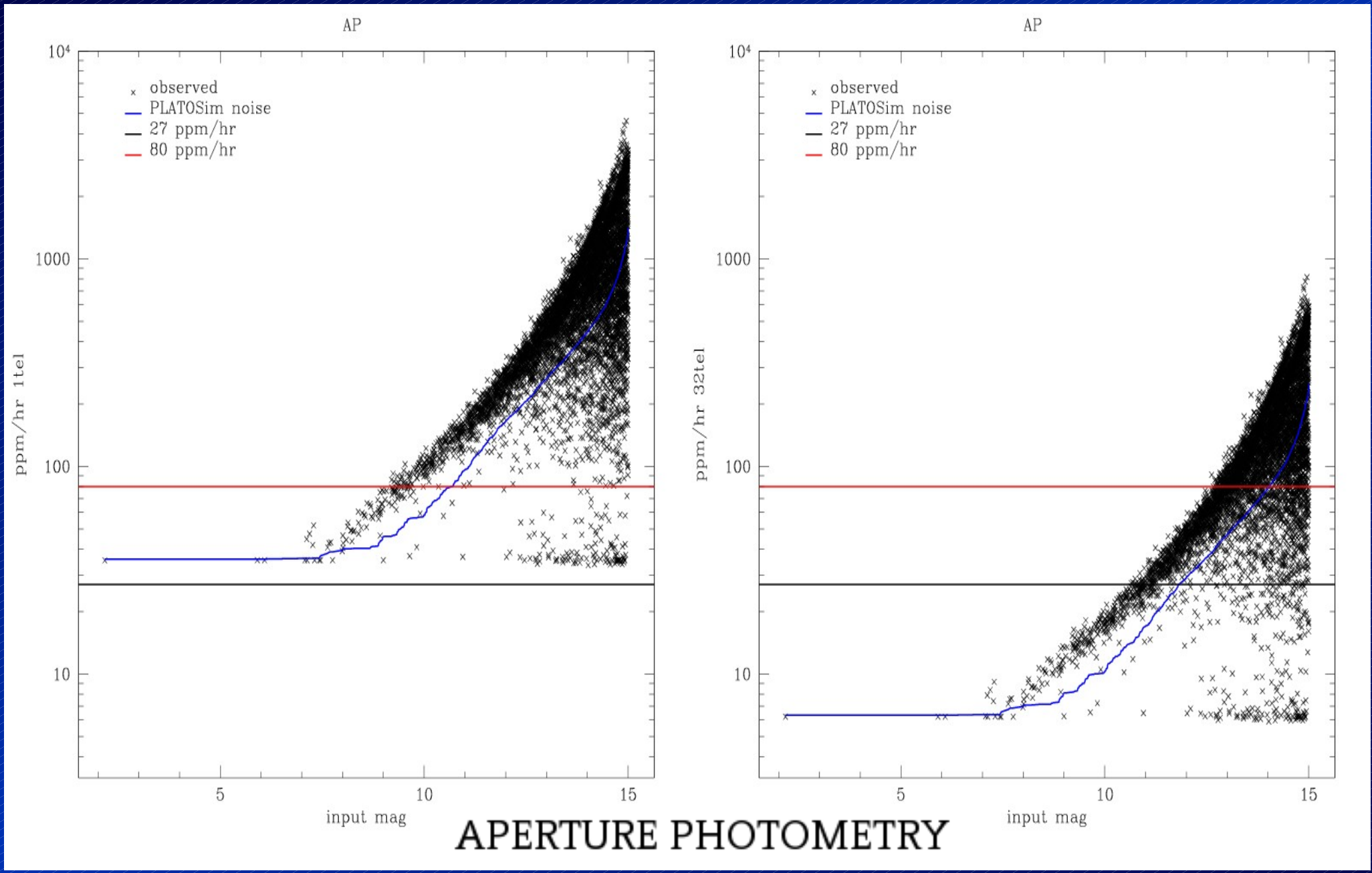
1 telescope

Simulation: 100 images (exposure=21.84s), sparse field, no jitter



1 telescope

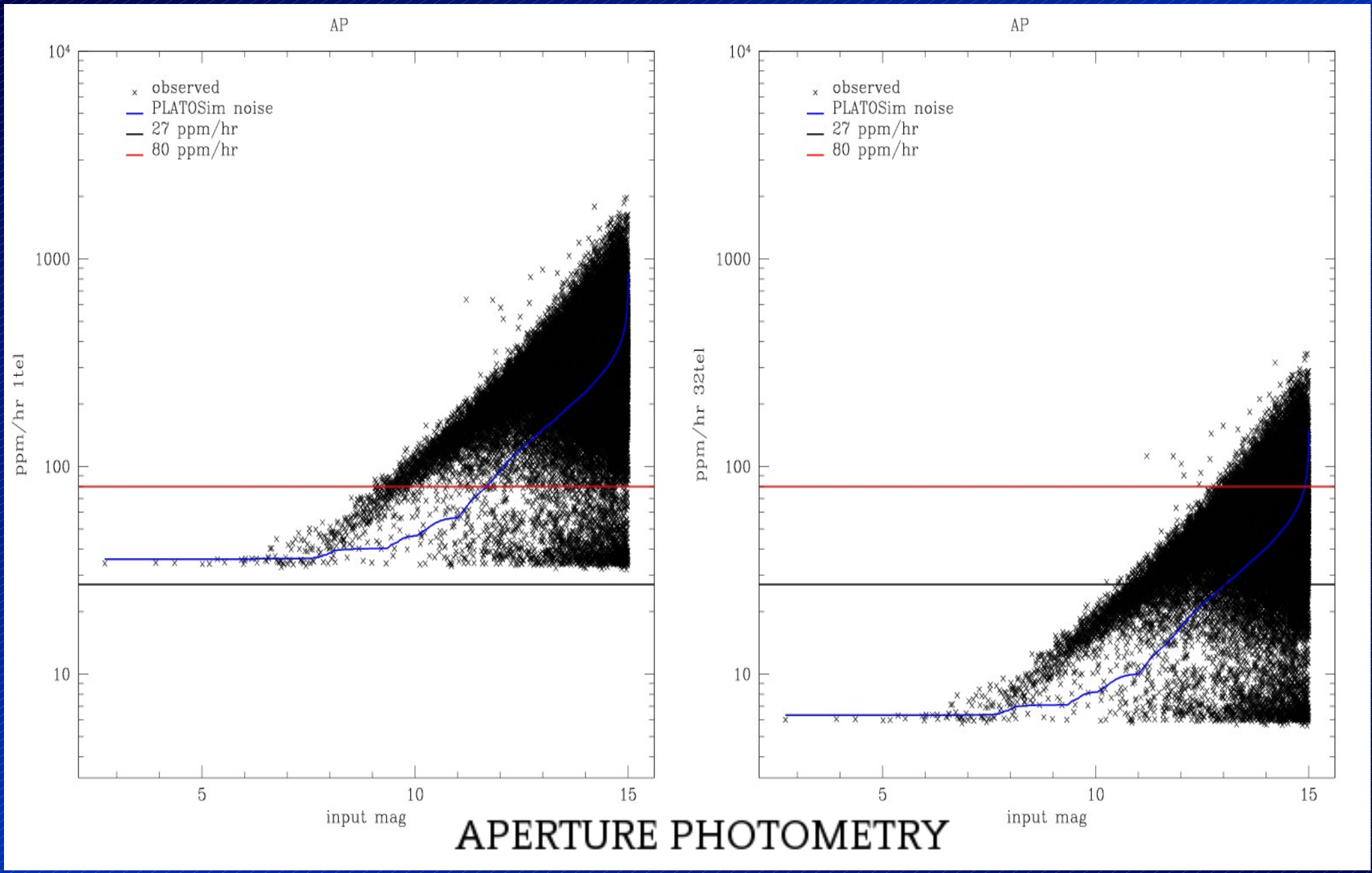
Simulation: 100 images (exposure=21.84s), sparse field, no jitter



1 telescope

32 telescopes

Simulation: 100 images (exposure=21.84s), dense field, no jitter



1 telescope

32 telescopes

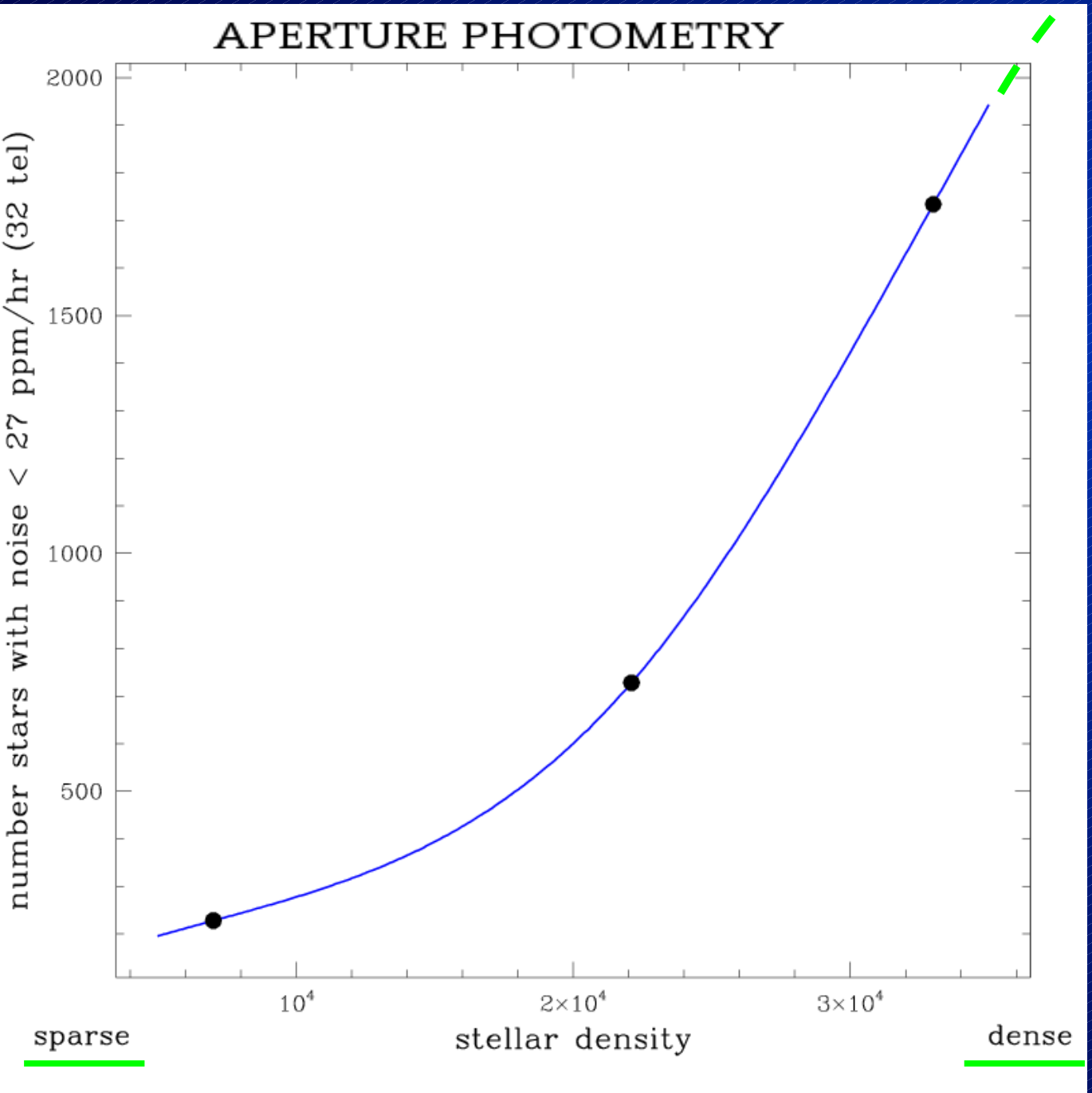
CONCLUSIONS

Dense field: **≈ 1700** (AP) stars with noise < 27 ppm/hr (not saturated)

Medium field: ≈ 700 (AP) stars with noise < 27 ppm/hr (not saturated)

Sparse field: **≈ 220** (AP) stars with noise < 27 ppm/hr (not saturated)

CONCLUSIONS



CONCLUSIONS

Simulations of field with different stellar density

Define threshold stellar density of the field

...preliminary results....needs: more simulations
implement N telescopes
'official' photometry algorithm

Final optical design and electronic devices to be defined