The frequency of planets orbiting stars with wide substellar companions

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Outline of the talk

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- → **Science objectives**
- → **Origins of the Project**

B
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Science objectives

(1) Frequency of planets orbiting stars with wide substellar companions ?

(2) Do wide companions to planet host stars influence their properties (eccentricity, inclination) ?

(3) To what degree wide companions influence the properties of Jupiter-type planets ?

Origins of the project

6200 sq deg

+

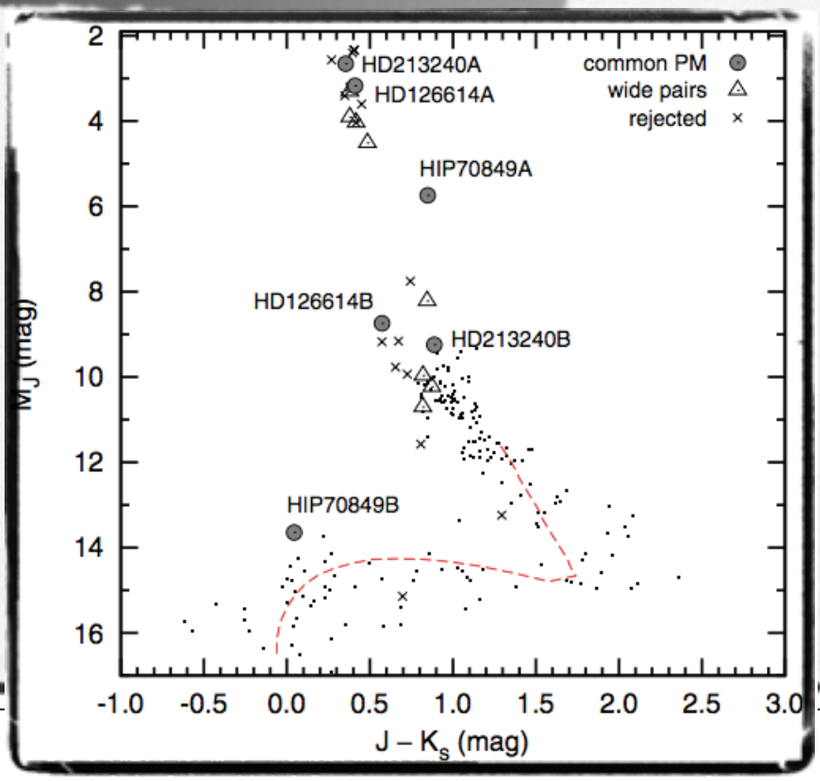
37 targets

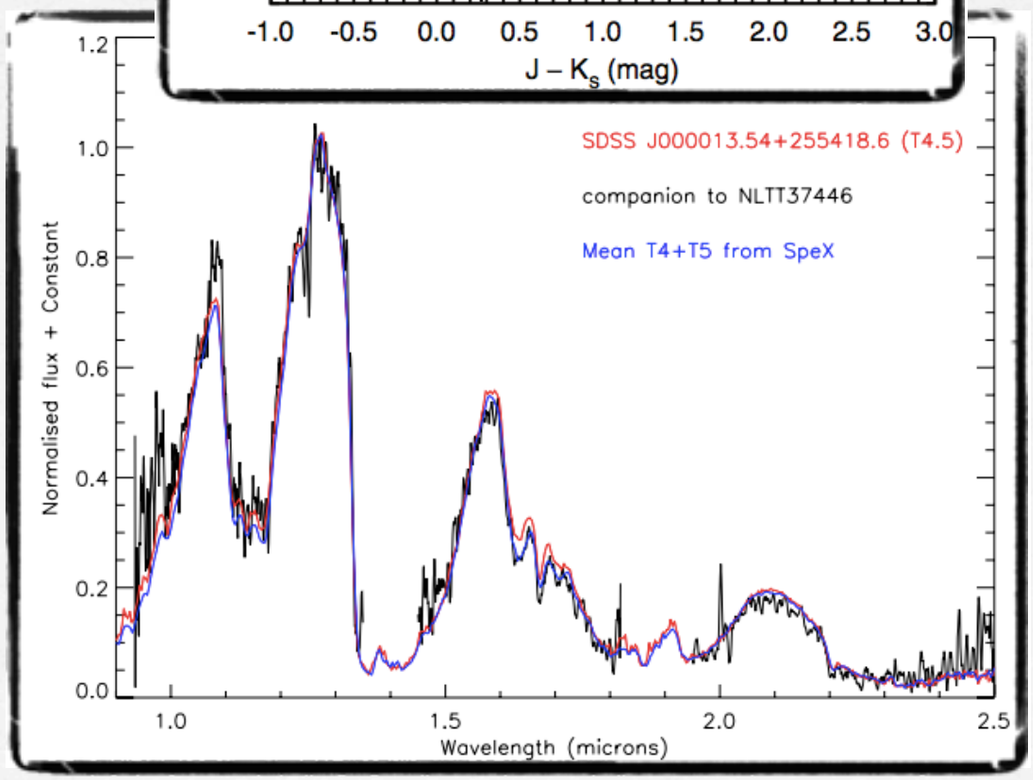
=> 1 G + M
=> 1 K + M
=> 1 K7+T4.5

HIP70849 K7V
9 M_{jup} planet and
wide T companion

Frequencies:
=> Stellar: 5.4+/-3.8%
=> BD: 2.7+/-2.7%

Lodieu et al. 2014, A&A, 120, 14





The sample

Bright: V <= 6 mag

HD3651 (K0V)

HD46588 (F7V)

GJ504 (K4V)

HN Peg (G0V)

Faint: V = 8.43 mag

HD203030 (G8V)

Q: how many stars with wide BD companions host planets ?

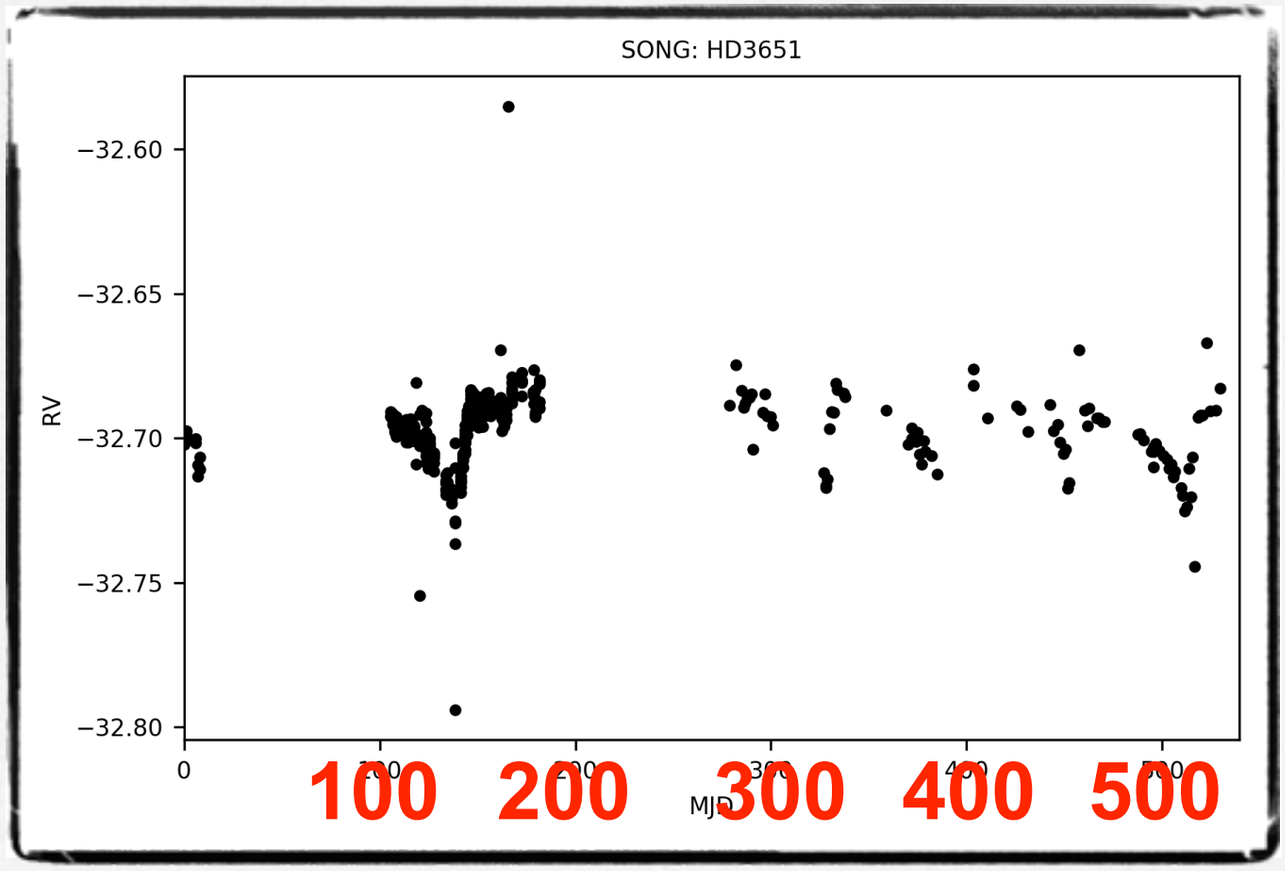
Summary of observations

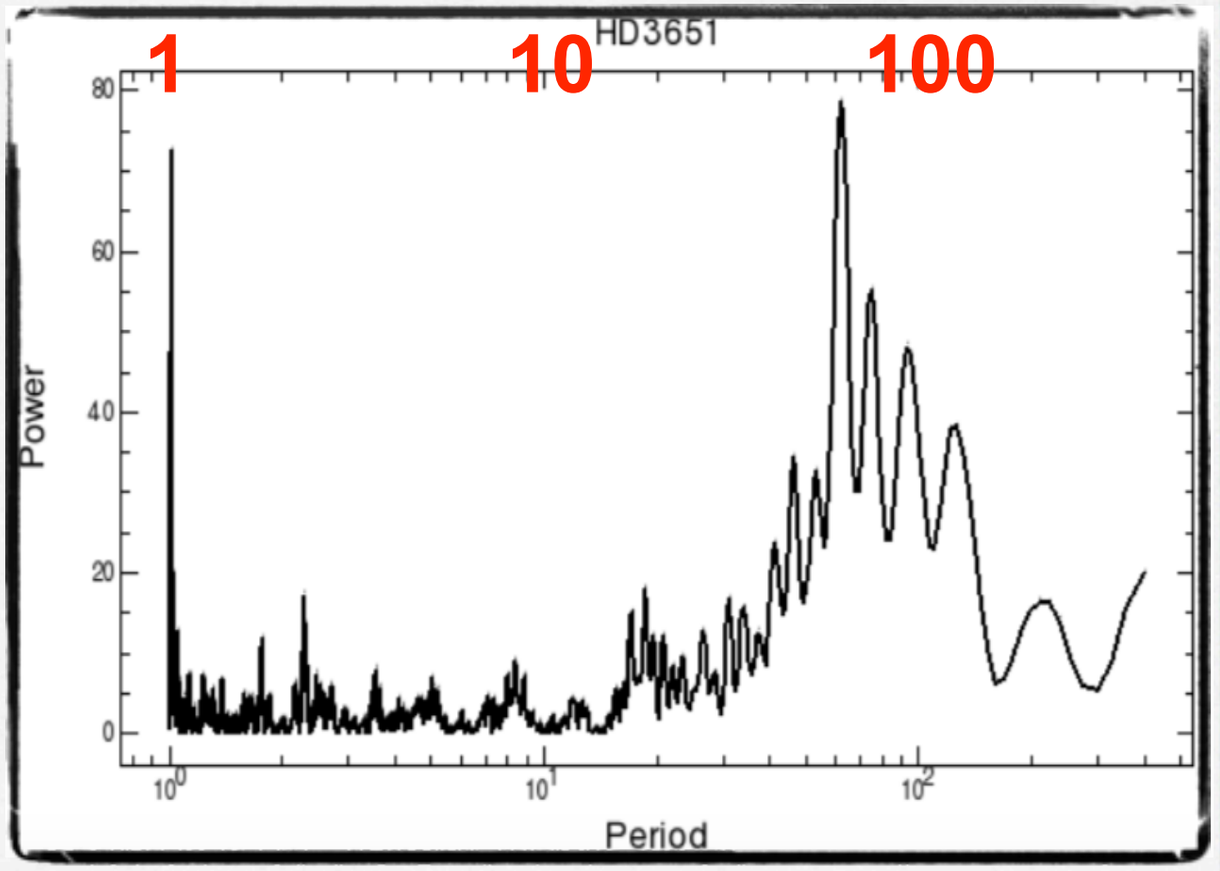
Spectroscopy with Th-Ar, slit = 1.2”, resolution 90,000

Name	V mag	ExpT	Epochs	Baseline
HD3651	5.88	420s	420	03 September 2014 to 14 February 2016
HD46588	5.45	900s	352	03 April 2015 to 06 March 2017
GJ504	5.81	600s	262	07 January 2016 to 19 August 2017
HN Peg	5.95	900s	250	22 April 2015 to 15 January 2017
HD203030	8.43	1800s	112	17 April 2017 to 29 September 2018

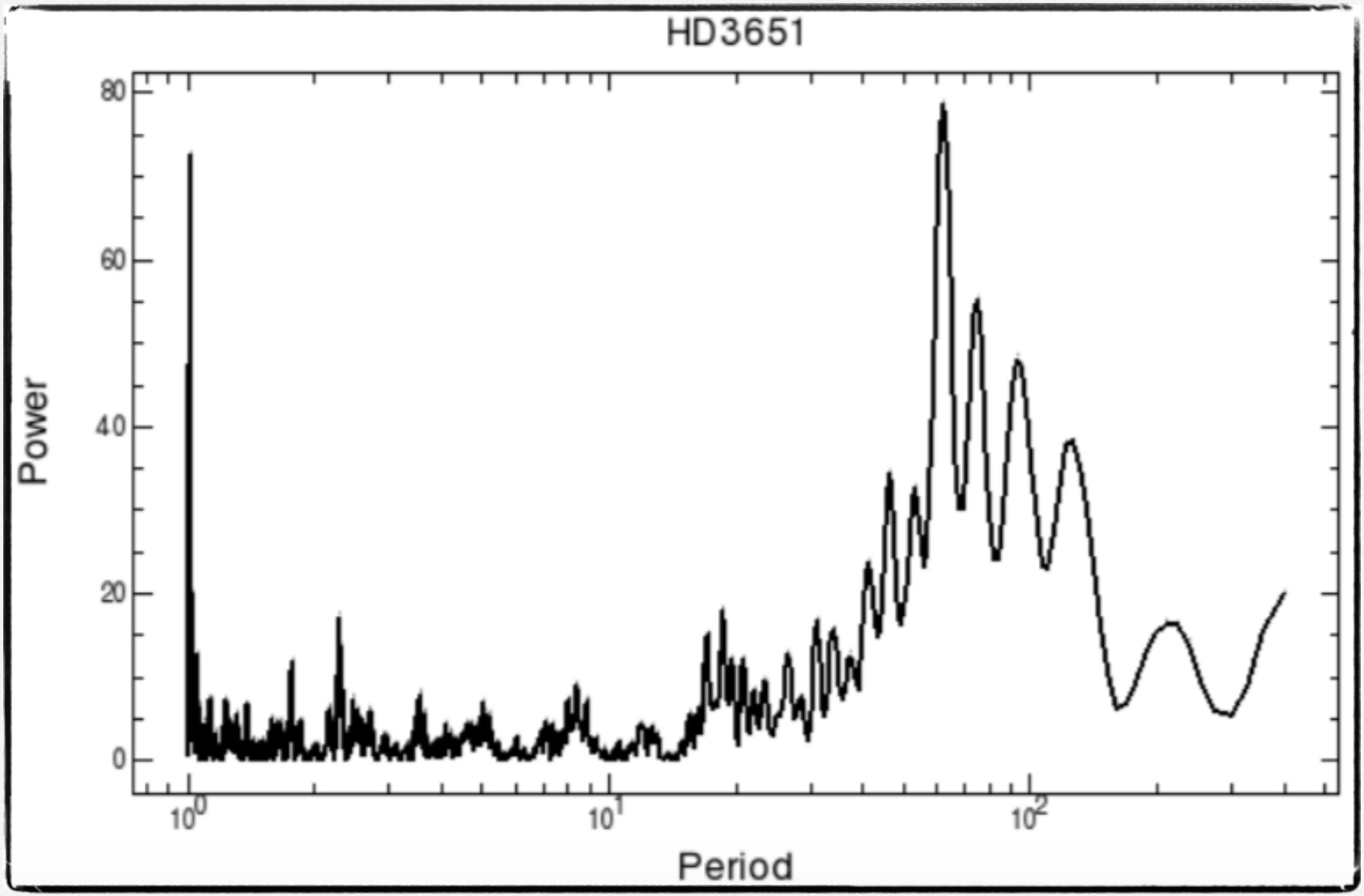
HD3651

SpT = K0V @ 11.1 pc Sep = 480 au SpT companion = T7.5



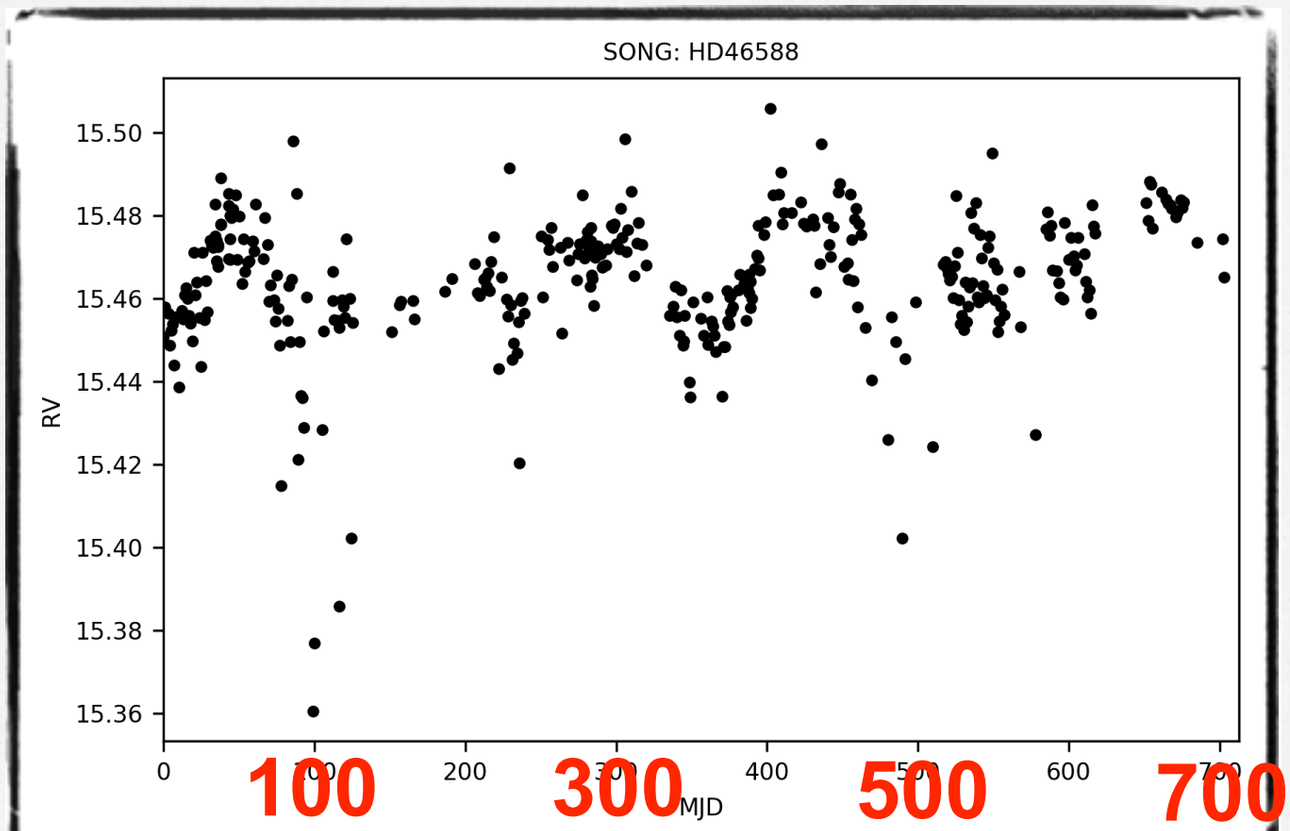


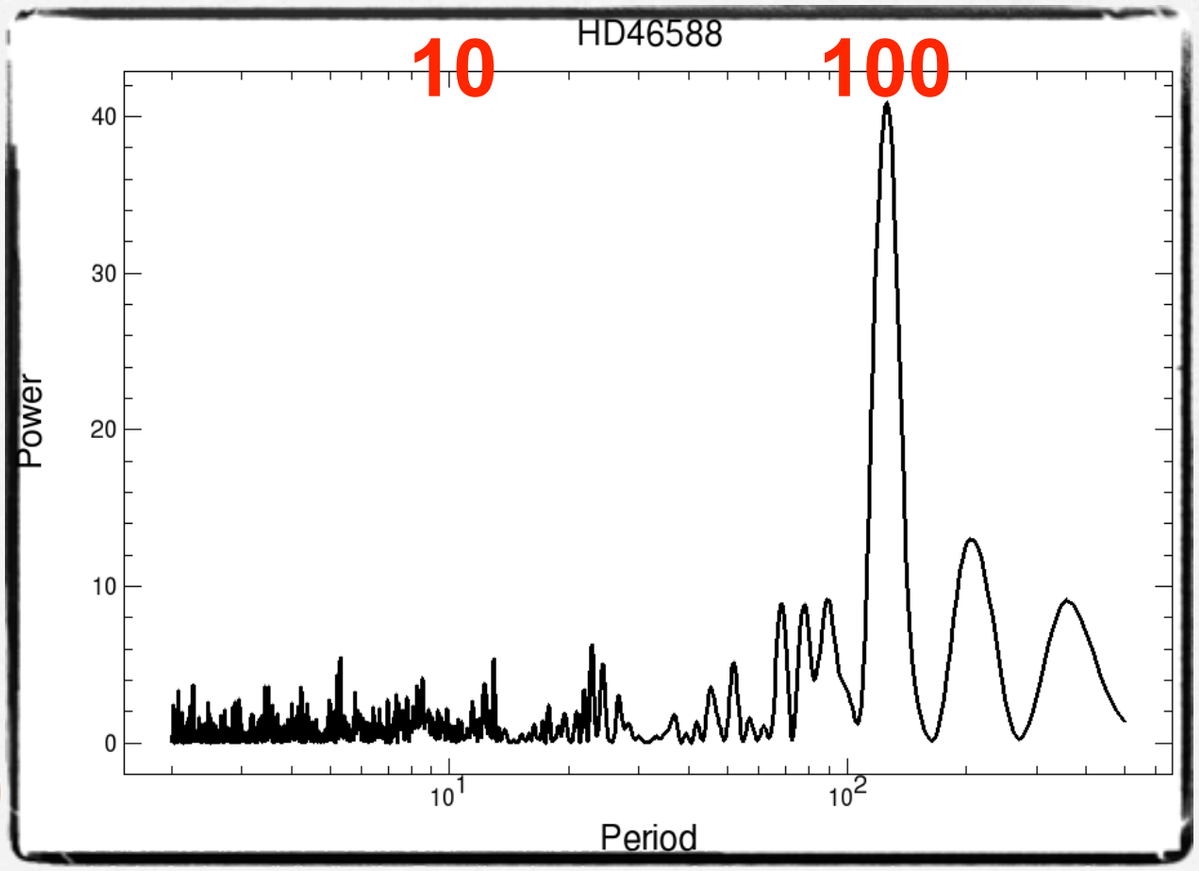
Mugrauer+2016; Liu+2007; Leggett+2017; Burgasser+2017


HD3651
80
60
40
20
0
Power
10^0
10^1
10^2
Period

HD46588

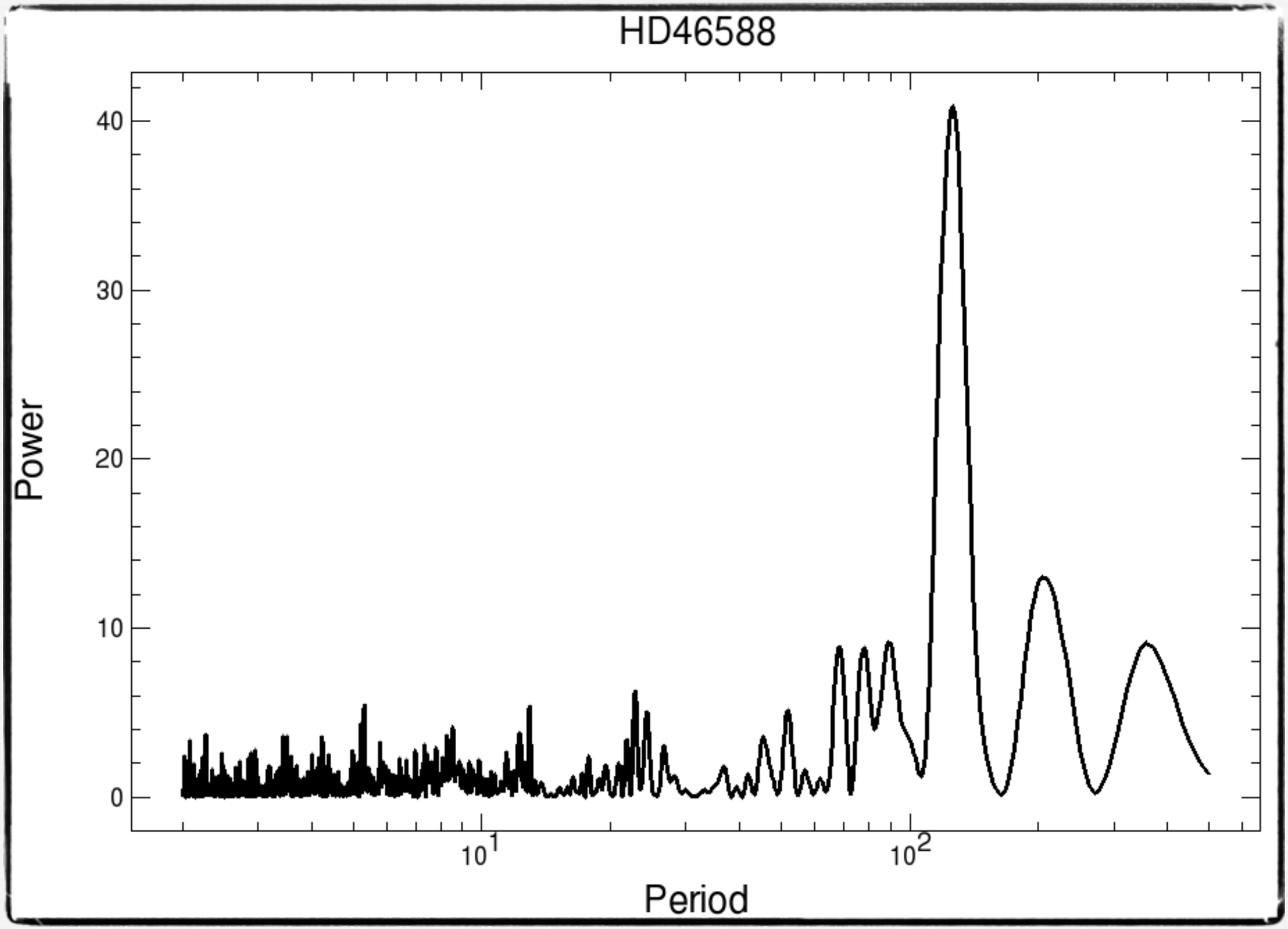
SpT = F7V @ 17.9 pc **Sep = 1420 au** **SpT companion = L9**





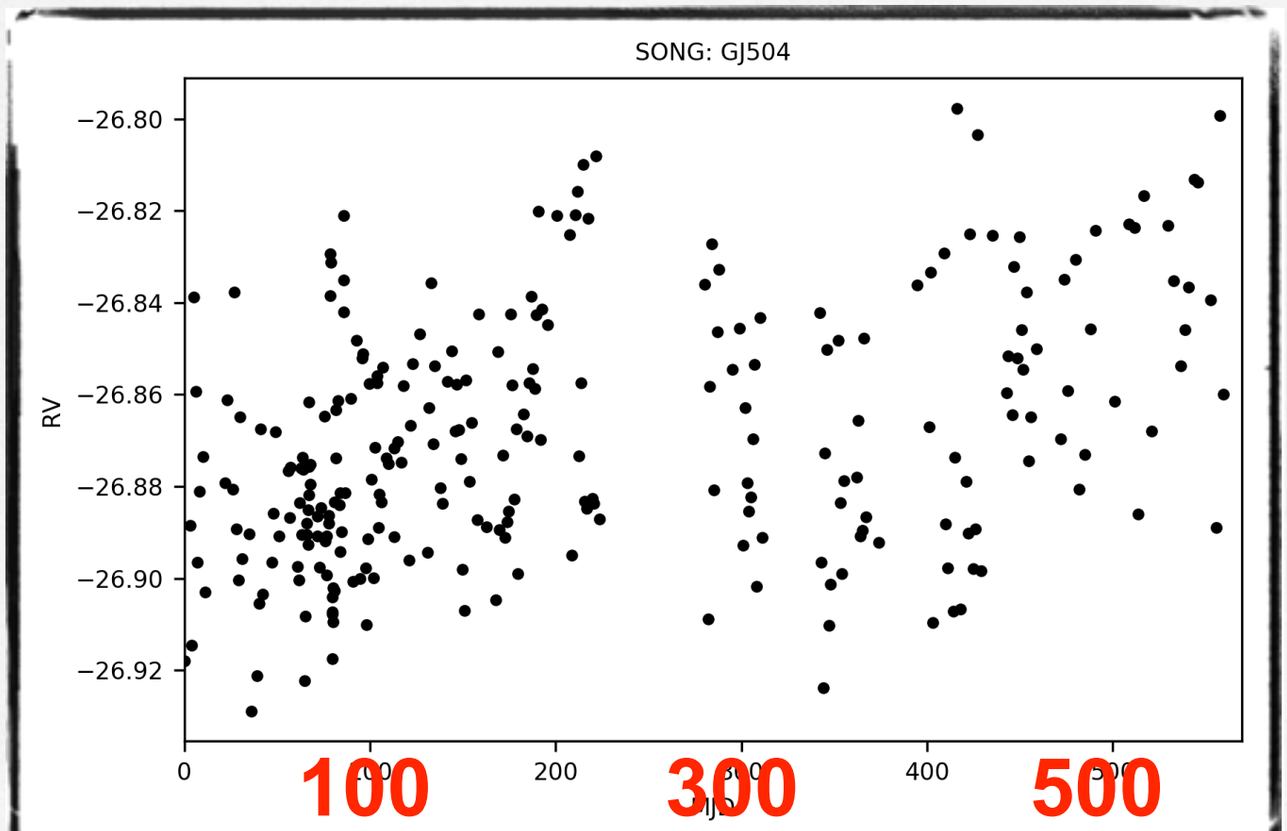
Loutrel+2011

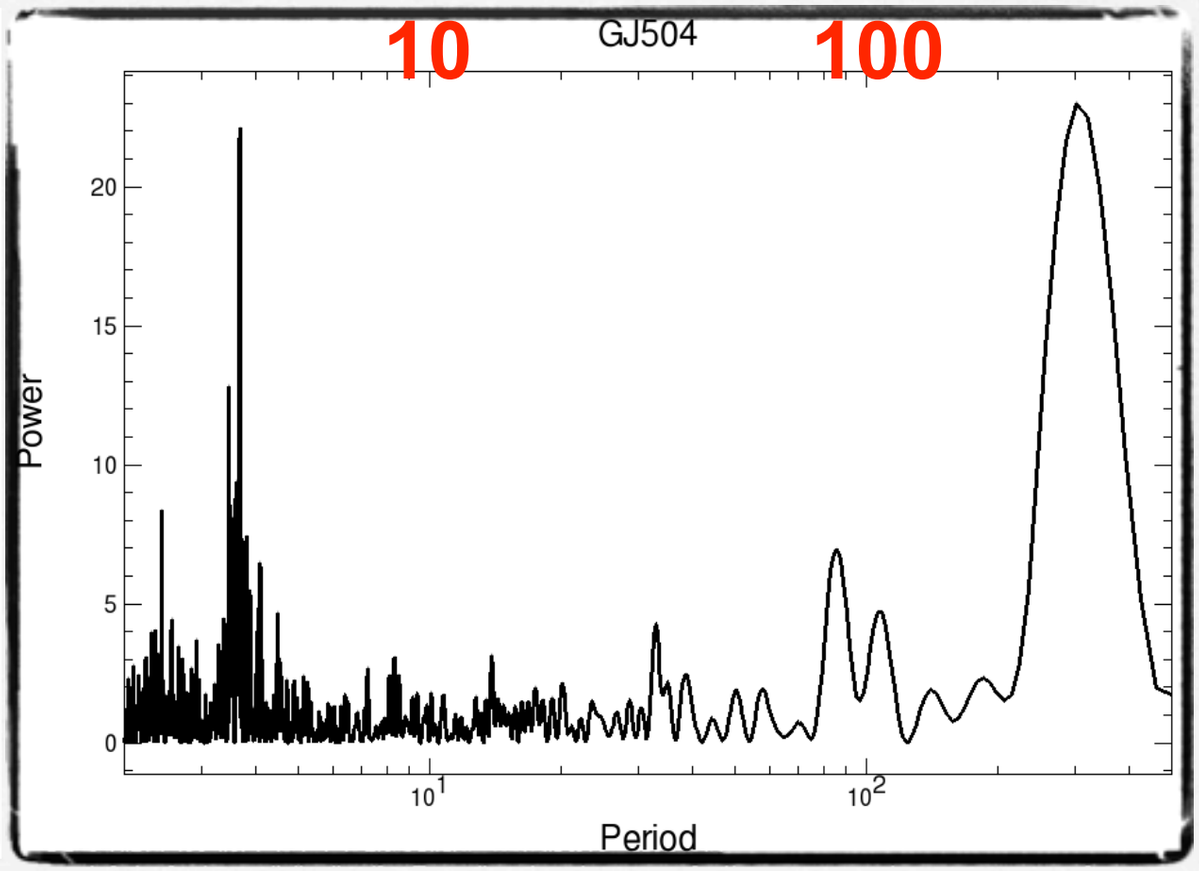
HD46588



GJ504

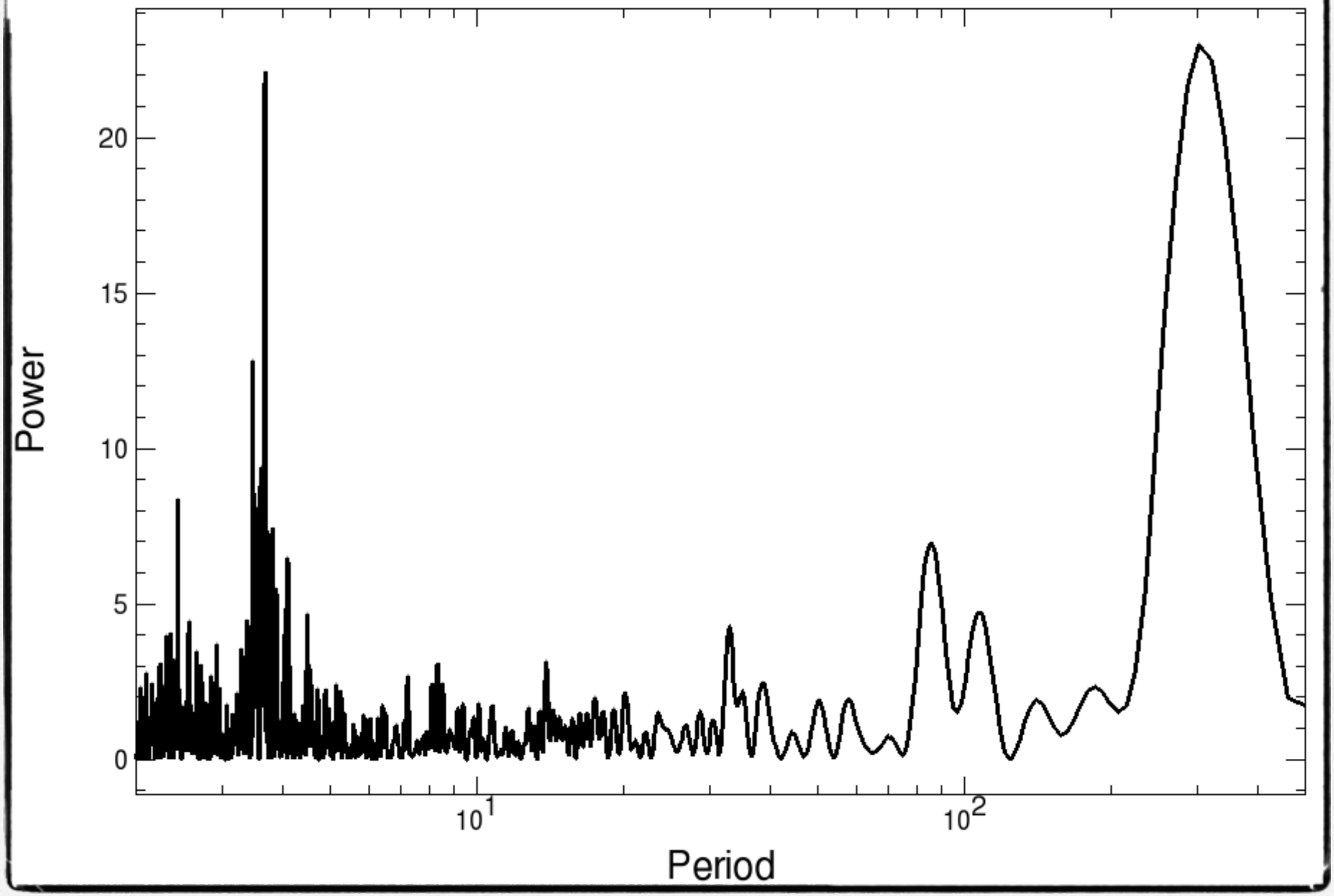
SpT = G0V @ 17.6 pc Sep = 43.5 au SpT companion = late-T





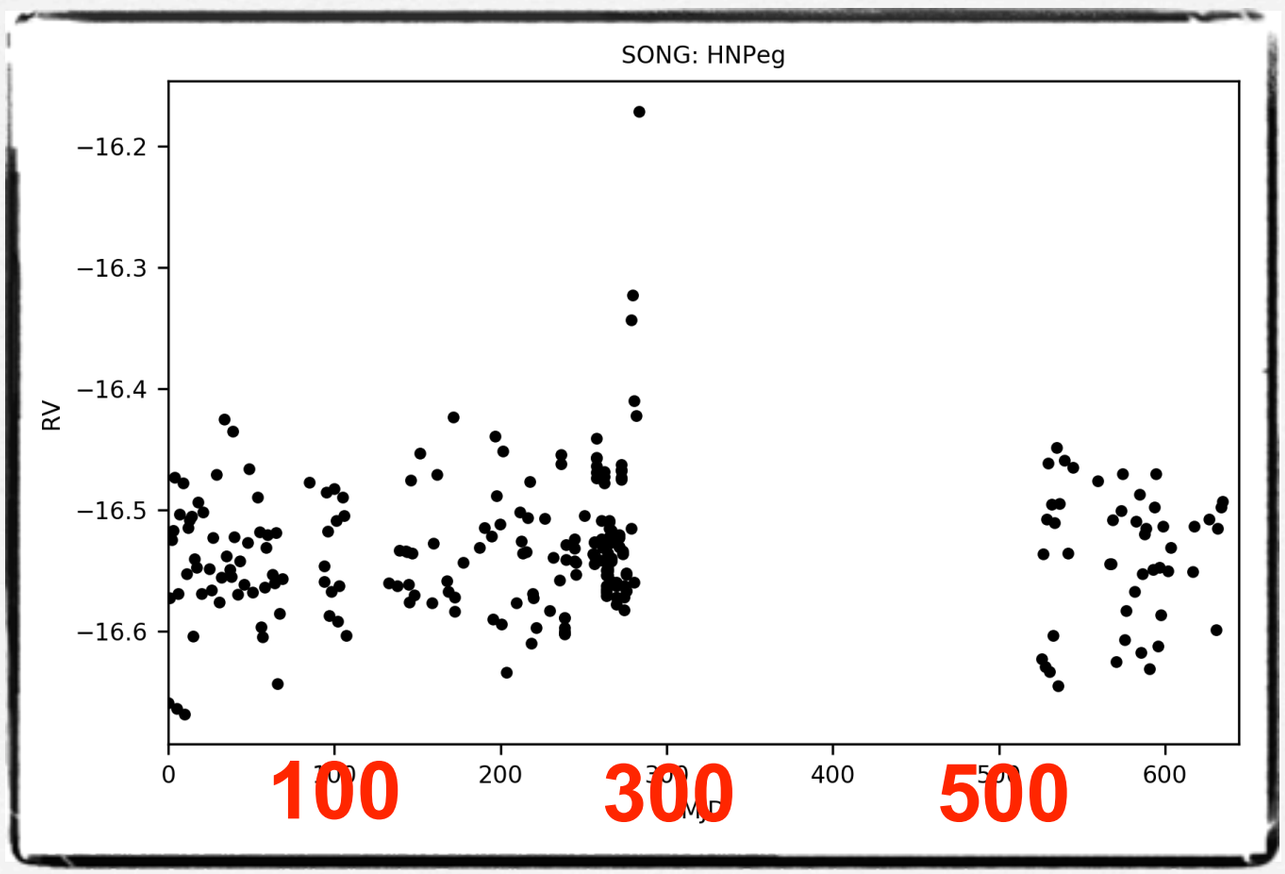
Kuzuhara+2013; Janson+2014; Skemer+2016

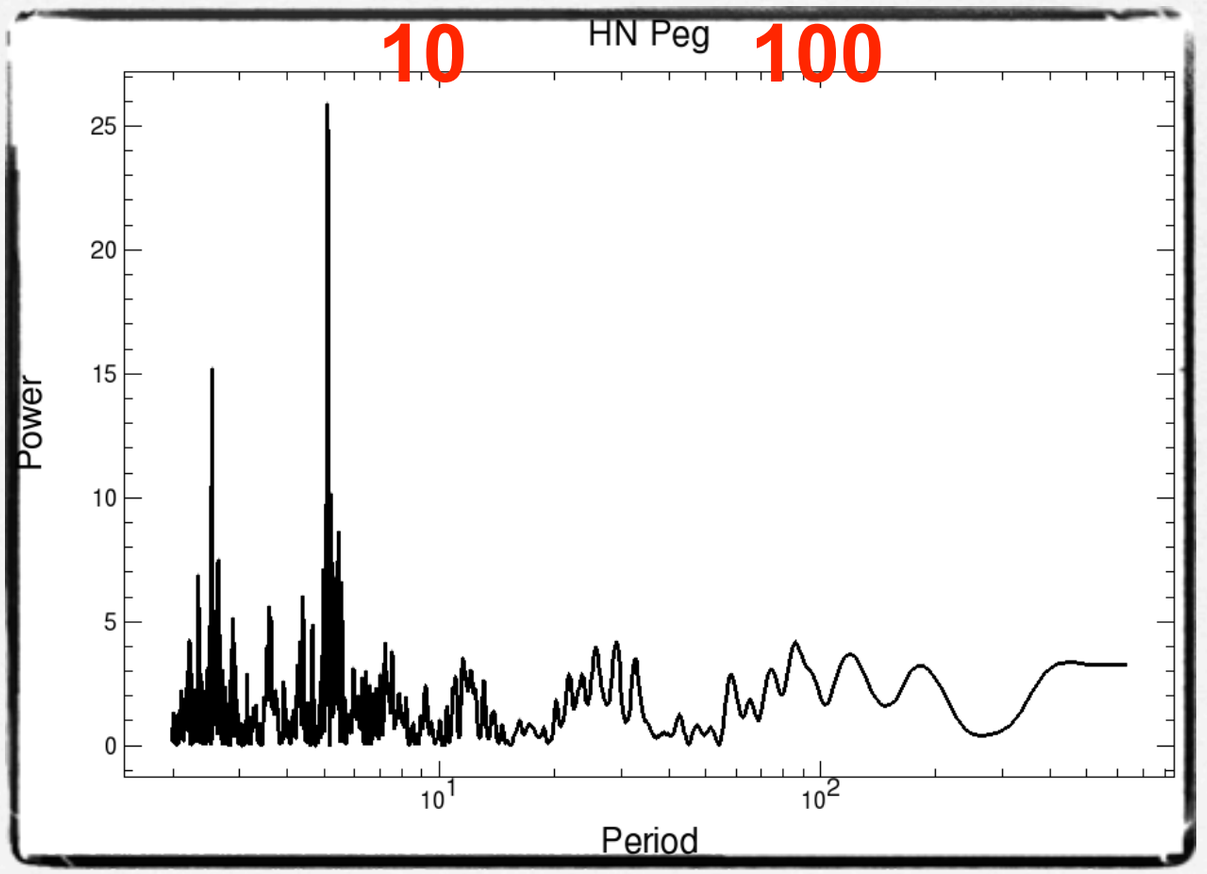
GJ504



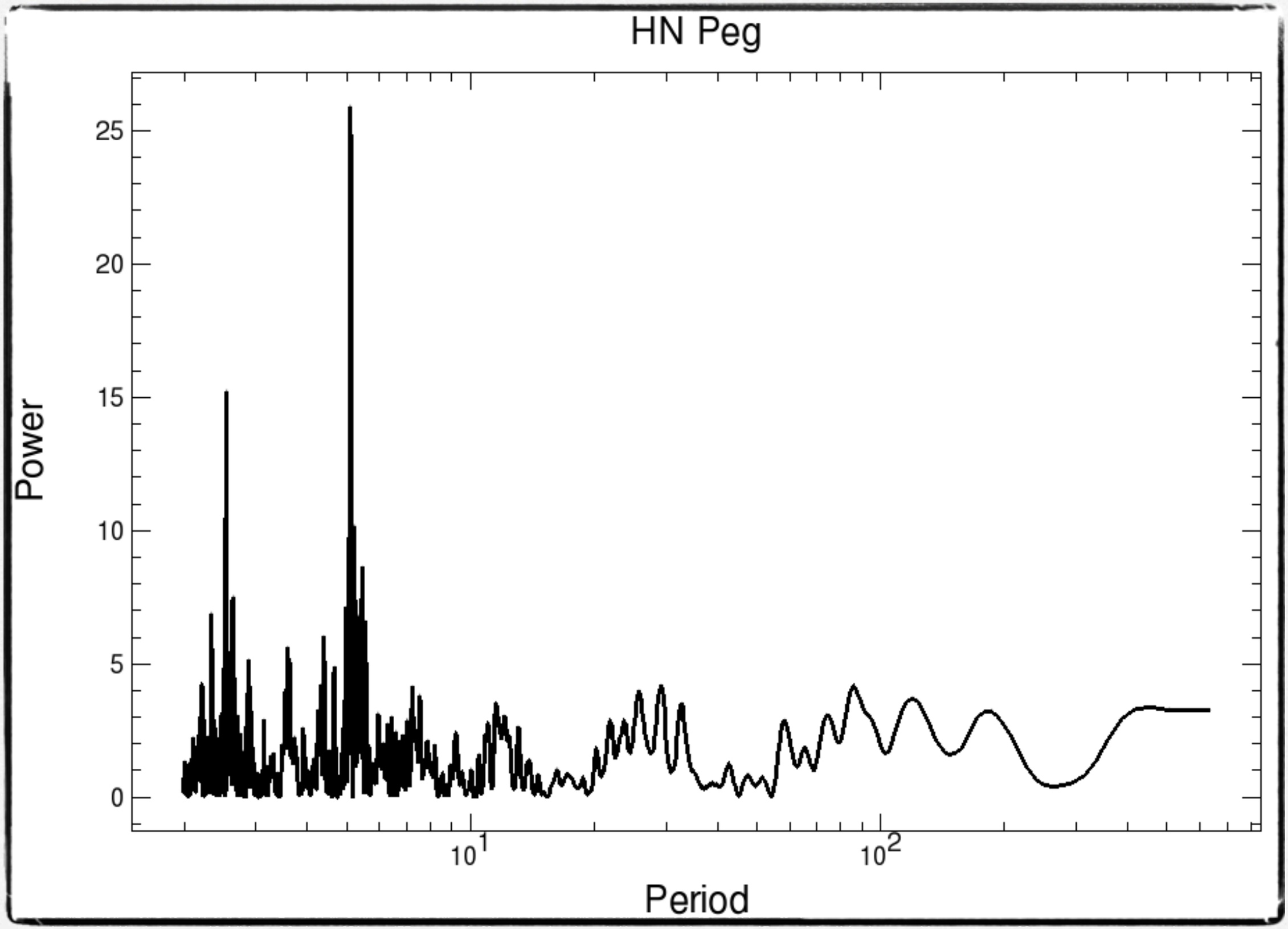
HN Peg

SpT = G0V @ 18.4 pc Sep = 795 au SpT companion = T2.5



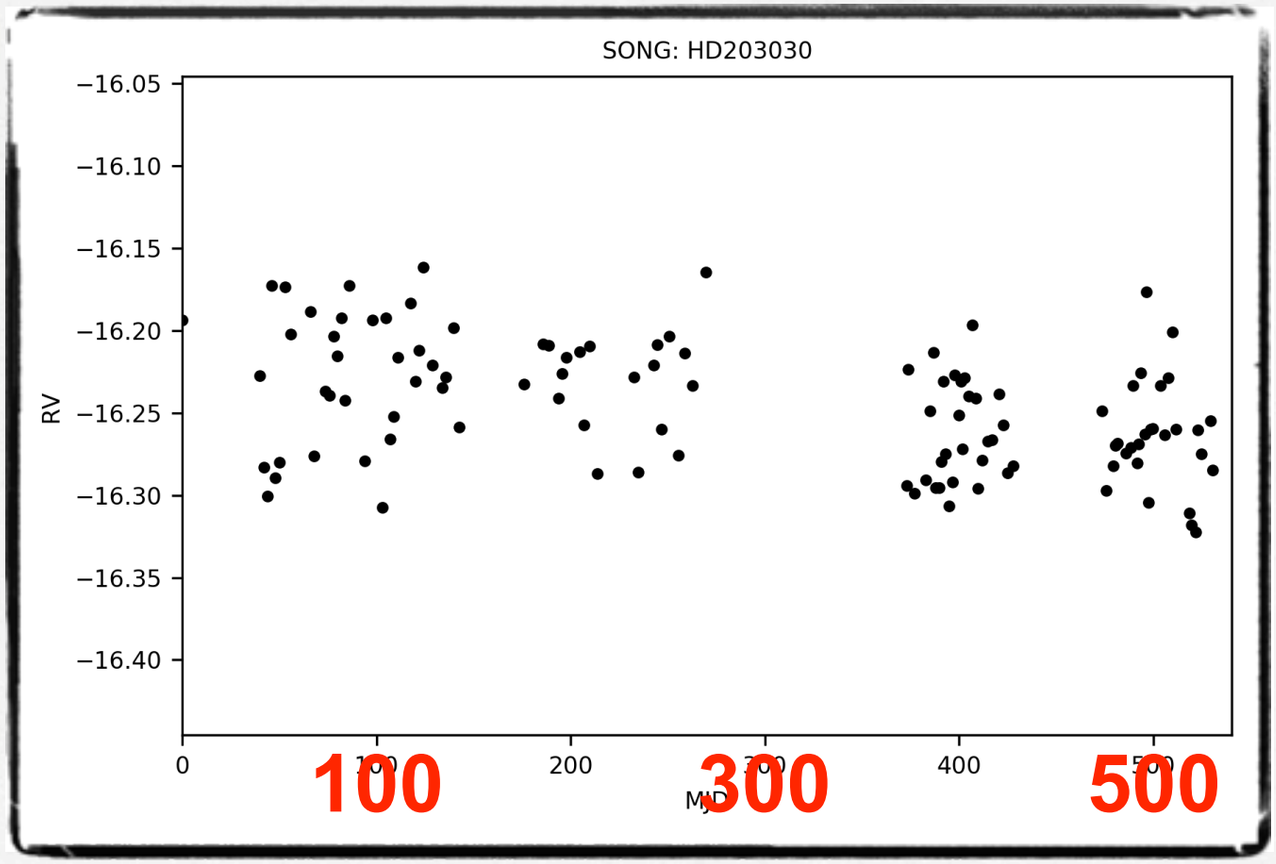


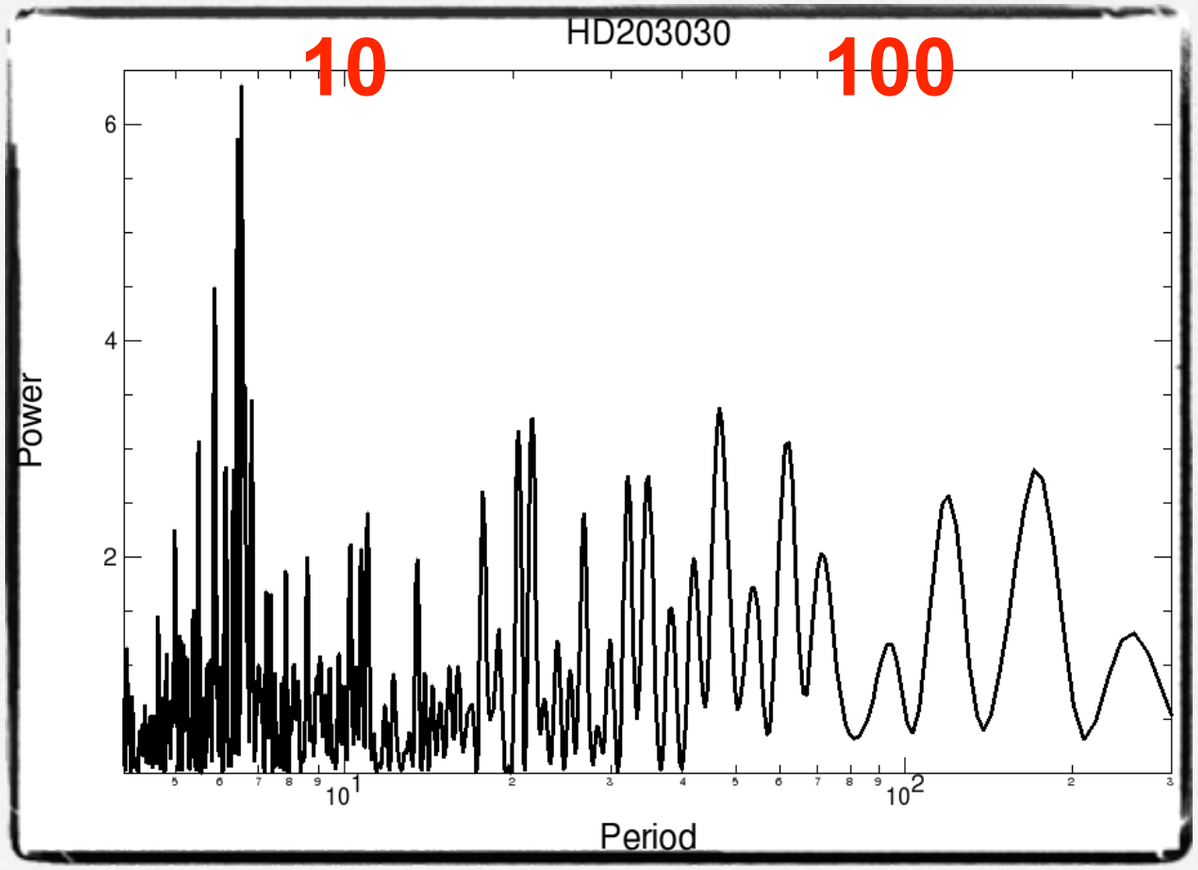
Luhman+2007


HN Peg
Power
Period
0
5
10
15
20
25
10^1
10^2

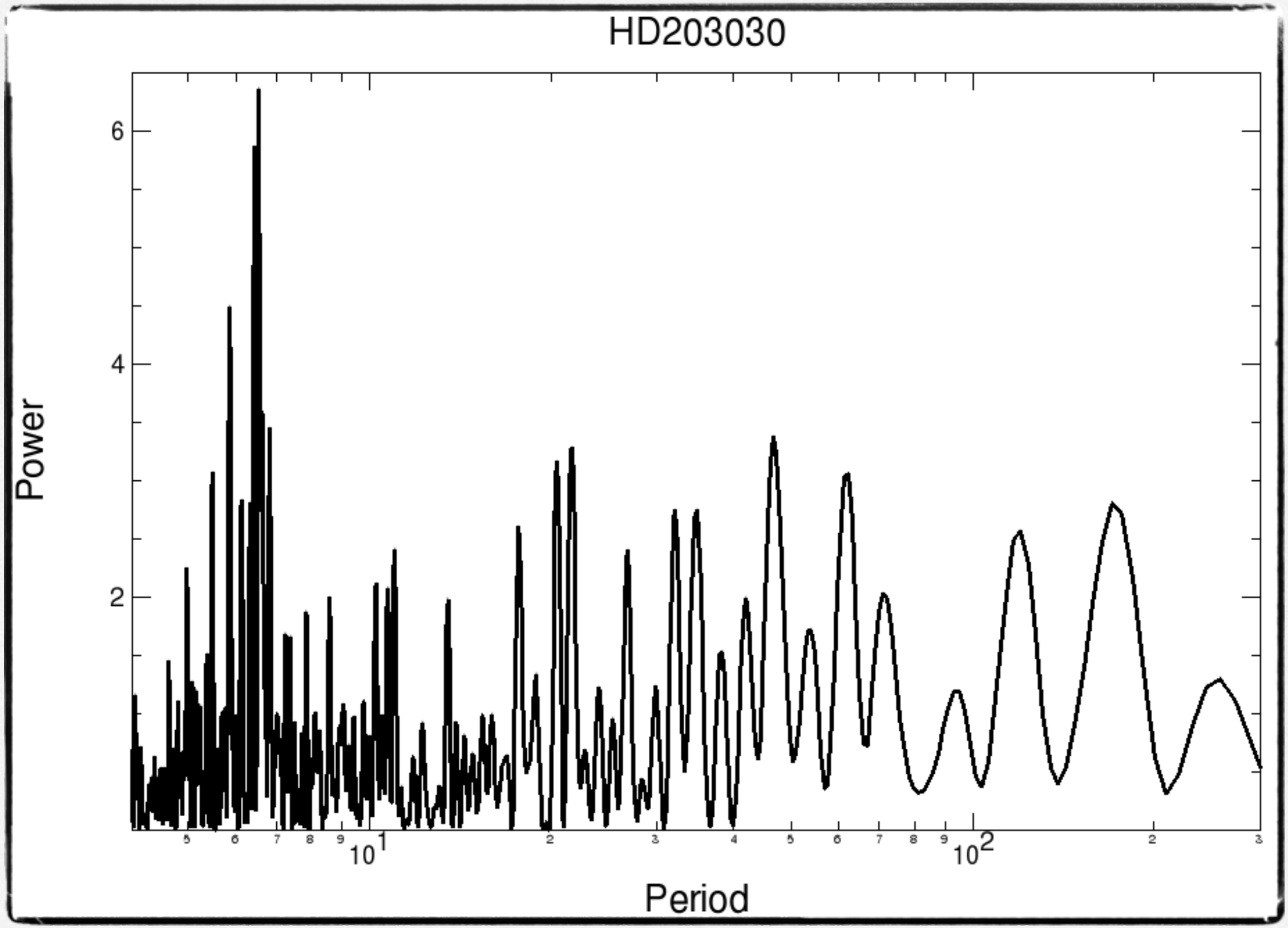
HD203030

SpT = G8V @ 40.9 pc **Sep = 487 au** **SpT companion = L7.5**



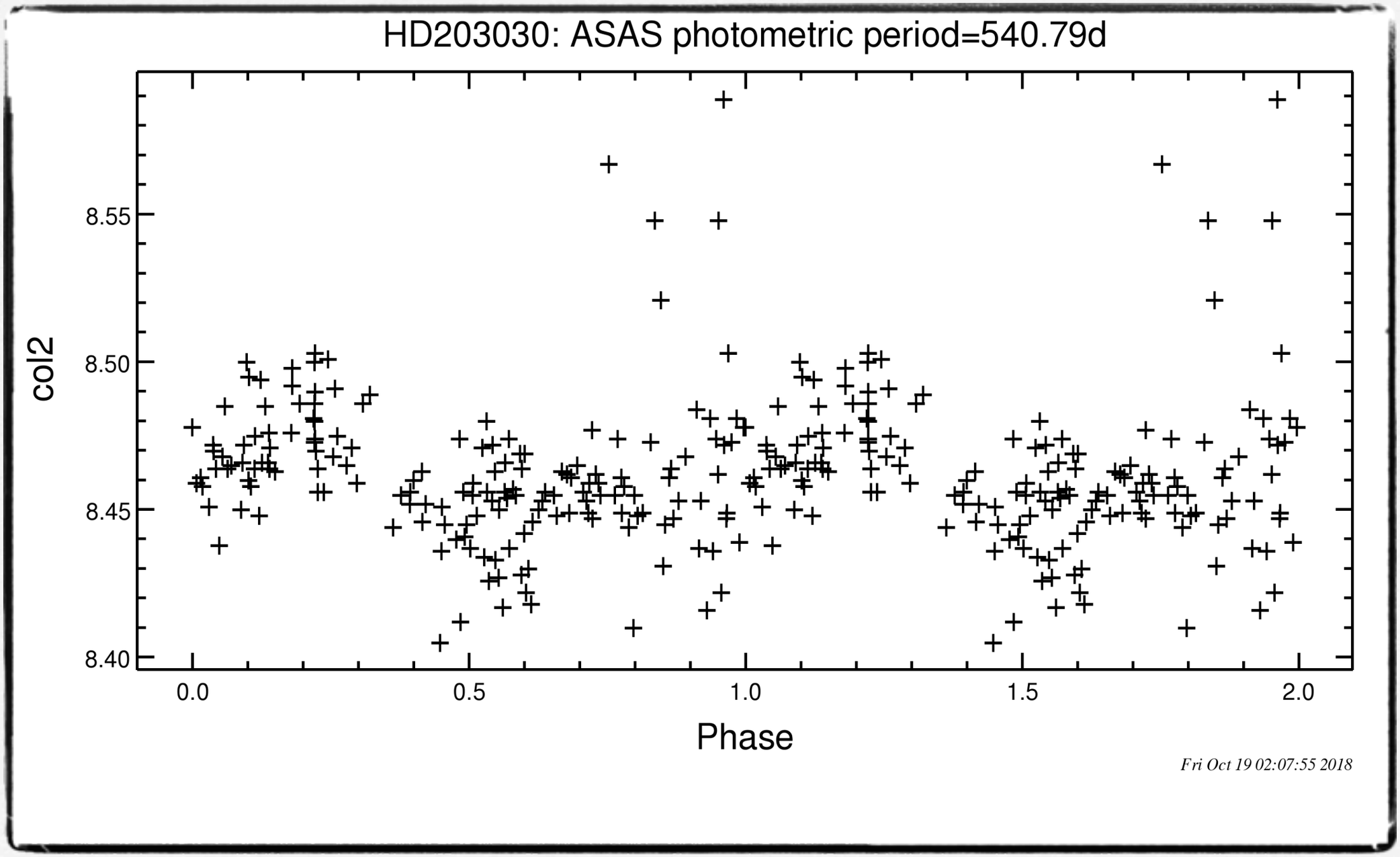


Matches and Hillenbrand 2006


HD203030
Power
Period
6
4
2
5
6
7
8
9
10^1
2
3
4
5
6
7
8
9
10^2
2
3

HD203030: magnetic cycle ?

SpT = G8V @ 40.9 pc **Sep = 487 au** **SpT companion = L7.5**



Summary

Name	Planet(s)	Period
HD3651	V	62d
HD46588	V	22.8d
GJ504	V	85d
HN Peg	X	
HD203030	?	6.5d

20% of solar-type stars with exoplanets are multiples

Frequency of planets around stars with wide substellar companions

>21.0-26.3 % vs 10.5% (initial)

==> more than in the field

Future work

➔ Correct periodograms for activity: CARMENES

➔ Longer baseline for current sample: SONG

➔ Combine with Chinese node to probe shorter periods

➔ Extend sample to fainter targets: SONG

Thank you for your attention