# A search for transiting planets around hot subdwarfs

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## Hot subdwarfs

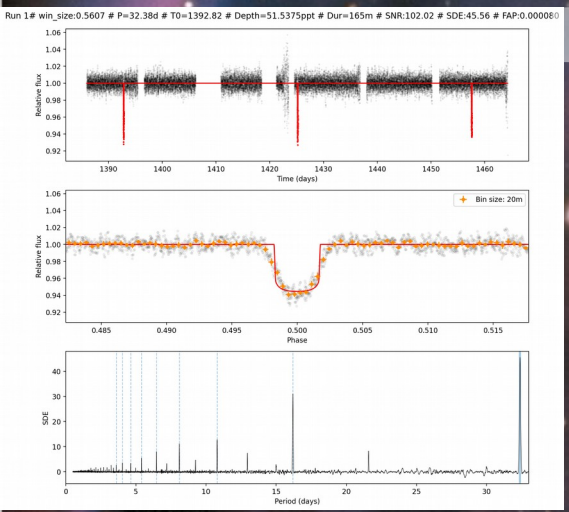
- Small stars (~0.2 $R_\odot$ for ~0.5 $M_\odot$)
- Most of envelope lost during RGB
- No confirmed planets

## Scientific objective

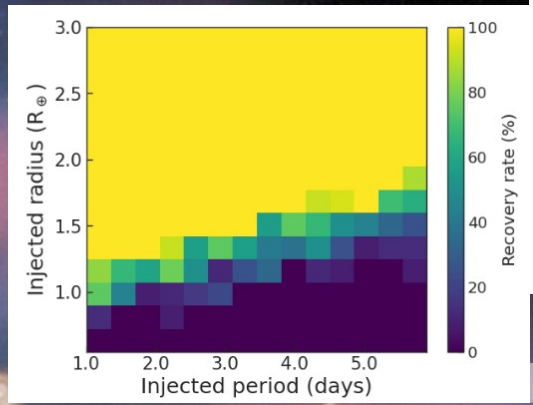
- Compute planetary occurrence rates after the Red Giant Branch
- Bring observational evidences for the fate of engulfed planets

## Method

Extracting data from the missions TESS, Kepler, K2, CHEOPS.
Looking for shallow transits on hot subdwarfs (Sherlockpipe, FELIX).
Performing injection & recovery tests for sensitivity (MATRIX).
Schedulling follow up observations (TRAPPIST, CHEOPS).




=> Detection of TOI 709.01



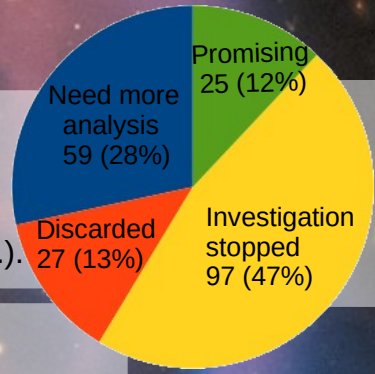

| Object ID | G Mag | Data length (d) | Injected body period: 1 d | 5 d | 15 d | 25 d | 35 d |
|---|---|---|---|---|---|---|---|
| *Kepler* | | | Smallest recovered body (R_Earth) | | | | |
| 8054179 | 14.3 | 90 | 0.3 | 0.5 | 0.8 | 1.0 | 1.2 |
| | | 30 | 0.5 | 0.6 | 1.0 | – | – |
| 3353239 | 15.2 | 30 | 0.6 | 0.8 | 1.1 | – | – |
| 5938349 | 16.1 | 30 | 0.7 | 1.1 | 2.0 | – | – |
| 8889318 | 17.2 | 30 | 0.9 | 1.2 | 2.4 | – | – |
| 5342213 | 17.7 | 30 | 1.2 | 1.7 | 3.2 | – | – |
| *K2* | | | | | | | |
| 206535752 | 14.1 | 80 | 0.6 | 0.8 | 1.0 | 1.5 | 2.1 |
| | | 30 | 0.6 | 0.9 | 1.6 | – | – |
| 211421561 | 14.9 | 30 | 0.7 | 1.4 | 1.9 | – | – |
| 228682488 | 16.0 | 30 | 1.0 | 1.4 | 2.5 | – | – |
| 251457058 | 17.1 | 30 | 1.4 | 2.3 | 3.4 | – | – |
| 248840987 | 18.1 | 30 | 2.1 | 3.3 | 5.4 | – | – |
| *TESS* | | | | | | | |
| 147283842 | 10.1 | 27 | 0.5 | 0.8 | 3.7 | – | – |
| 362103375 | 13.0 | 27 | 1.2 | 1.7 | >10 | – | – |
| | | 162 | 0.8 | 0.8 | 1.2 | 1.6 | 2.9 |
| 096949372 | 13.0 | 27 | 1.2 | 1.7 | >10 | – | – |
| 441713413 | 13.1 | 27 | 1.2 | 1.5 | >10 | – | – |
| | | 54 | 1.2 | 1.7 | 4.0 | >10 | >10 |
| 085400193 | 14.1 | 27 | 1.8 | 2.4 | >10 | – | – |
| 220513363 | 14.1 | 27 | 2.0 | 3.2 | >10 | – | – |
| | | 81 | 1.6 | 2.3 | 3.0 | 3.4 | 6.4 |
| 000008842 | 15.0 | 27 | 3.2 | 4.7 | >10 | – | – |

## Injection-recovery results

=> Example of output from an injection & recovery test.

## Status

TESS cycle 1 fully analysed (792 hot subdwarfs).
Several dozen of signals under follow up exploration.
Independant recovery of numerous objects (WD, BD, ...).




Shares of all the 208 signals detected and ranked by interest.

Promizing : planetary transit not excluded.

Inv. Stopped : Evidences not strong enough to poursue analysis.

Discarded : Planetary transit not consistent with the data.

## Conclusion

- Potential < 1 $R_\oplus$ remnants are detectable.
- ~2300 targets allowing the computation of robust statistics.
- Numerous signals detected and under follow up observation.
- High implications for the survival of planets during the RGB.

References

Project definiton : *Van Grootel, et al., 2021, A&A 650, A205.*
Sherlockpipe: *Pozuelos et al., 2020, A&A 641, A23.*
Hot subdwarfs: *Heber U., 2016, PASP, 128, 082001.*