PLATO DETERMINE THE MATERIAL PLANETS ARE MADE OF!

Precisiebeurs 2023

15-11-2023 Gabby Aitink-Kroes



5 ways to find a planet

- Radial Velocity
 - Watching for Wobble
 - 1068 planets discovered
- Direct Imaging
 - Taking Pictures
 - 69 planets discovered
- Gravitational Microlensing
 - Light in a Gravity Lens
 - 204 planets discovered

- Astrometry
 - Minuscule Movements
 - 3 planets discovered
- Transit

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- Searching for Shadows
 - 4132 planets discovered

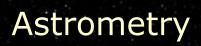
Radial Velocity



Direct Imaging

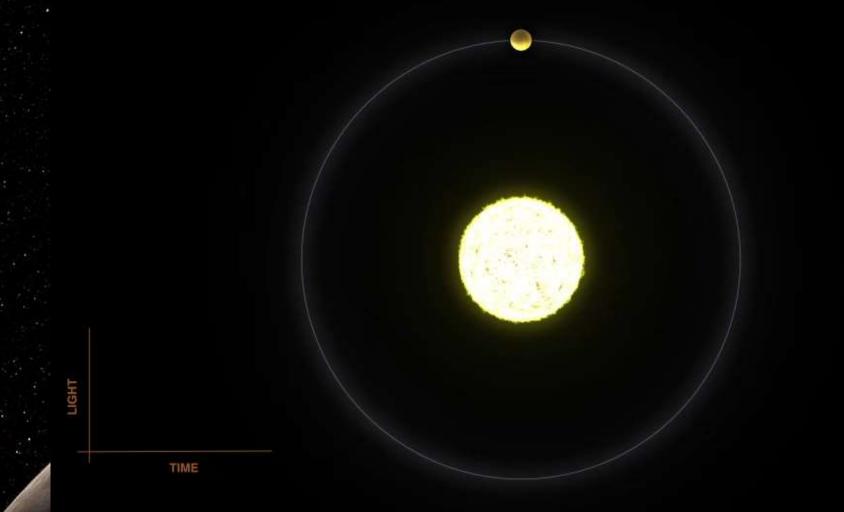
Gravitational Microlensing

Credits: NAS/





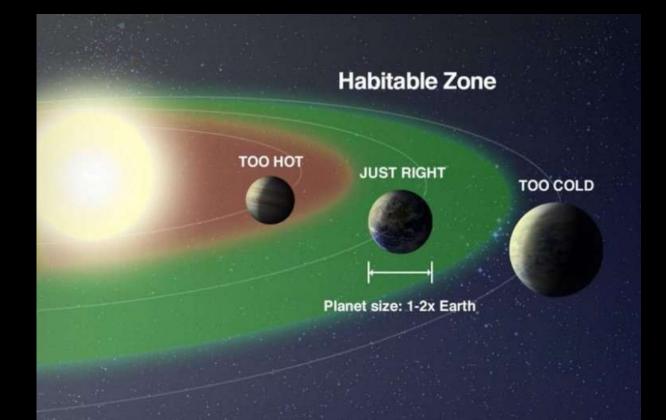




Credits: NASA

Search for life

- Planets with Earth like properties
 - Rocky planet
 - liquid water planets' surfaces.
 - Neither too hot nor too cold
 - "habitable zone" aka Goldilocks' zones





Asteroseismology

- The speed of a wave through a medium carry's information about that medium
 - Temperature
 - Density

- The brightness variations of stars inform scientists about their internal workings.
 - scientists can deduce general properties like:
 - their mass
 - radius
 - age.

ESA

Credits:

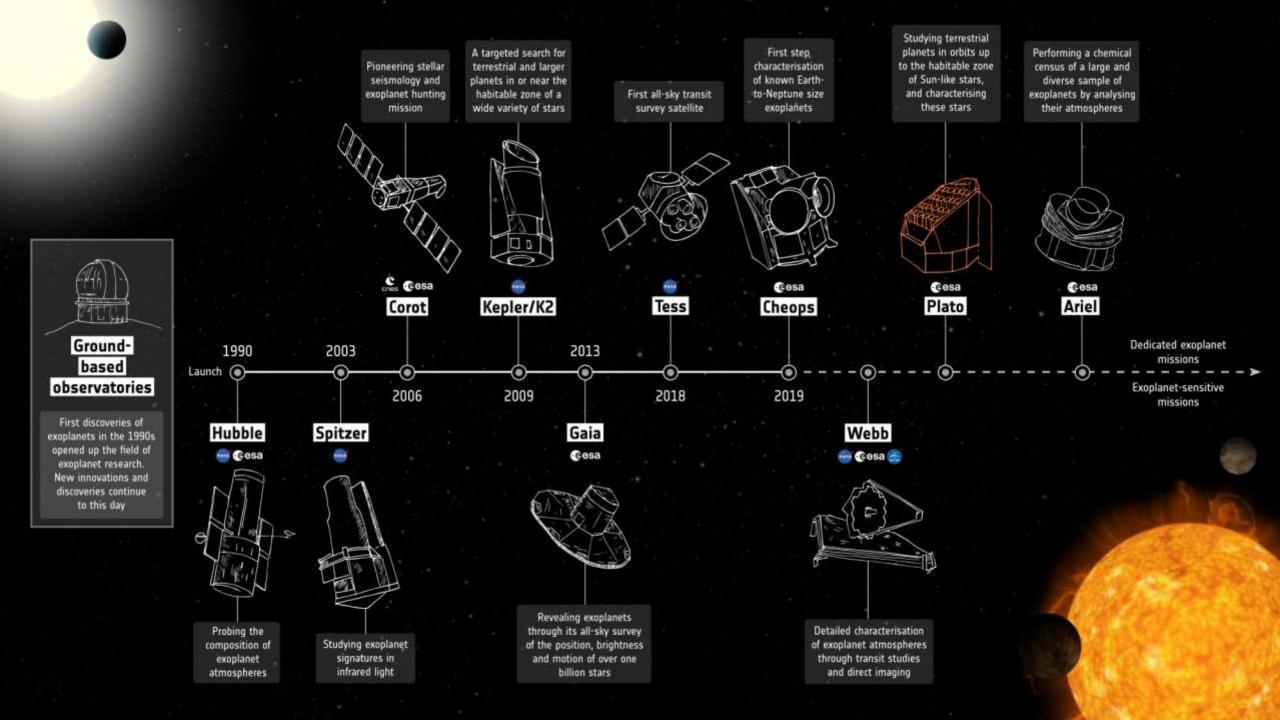


The PLATO mission

- PLAnetary Transits and Oscillations of stars
 - Detection of terrestrial exoplanets in orbits up to the habitable zone of Sun-like stars
 - Characterization of their bulk properties to determine their habitability
 - Measure the size, age and mass of exoplanets
 - Discover exomoons and rings around the planets.
 - Characterisation of planets' host stars
 - Identify targets for follow up observations for radial velocity (mass) and spectroscopic (atmosphere) measurements







The PLATO mission

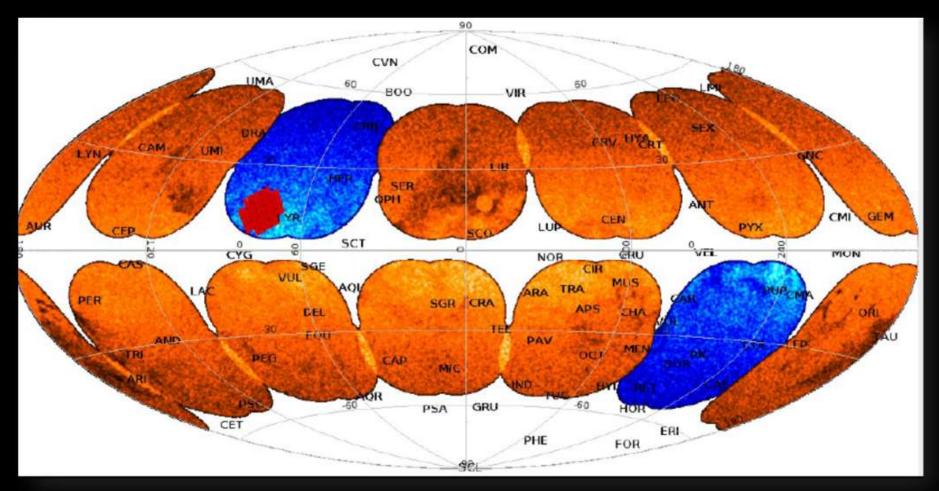
- PLATO will study relatively bright stars
 - more accurate determination of planetary parameters
 - Easier to confirm planets and measure their masses
 - Longer dwell time
 - making it sensitive to longer-period planets.
- 26 refractive telescopes
 - 24 "normal"

Netherlands Institute for Space Research

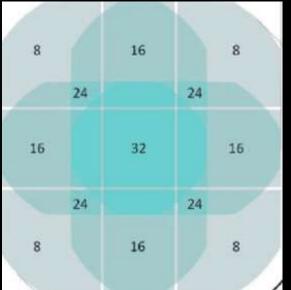
- 2 "fast"
- Field of view of about 2,250 deg2 per pointing
- Lifetime:
 - Nominal science operations 4 years
 - In-orbit lifetime 6.5 years
 - Consumables for 8 years



Skycoverage





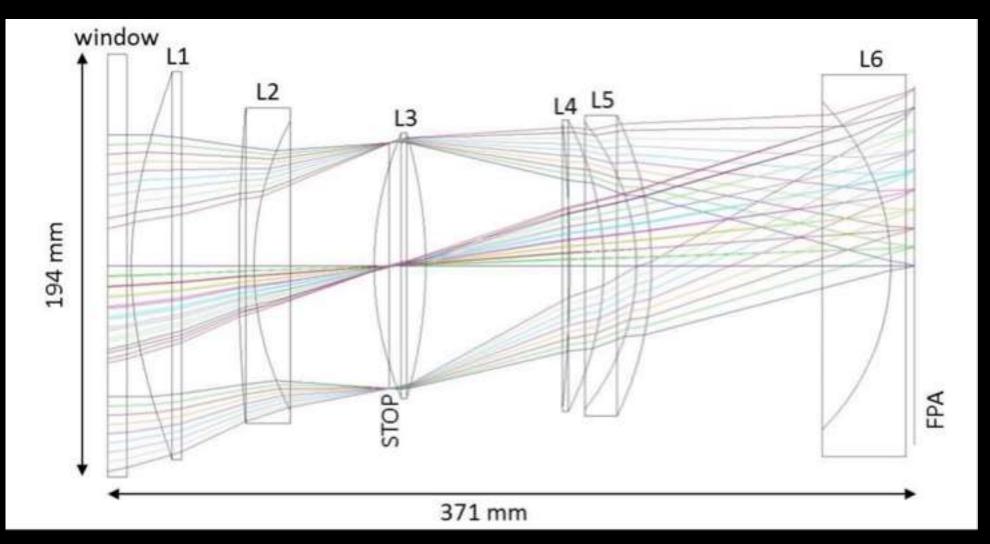


The real deal



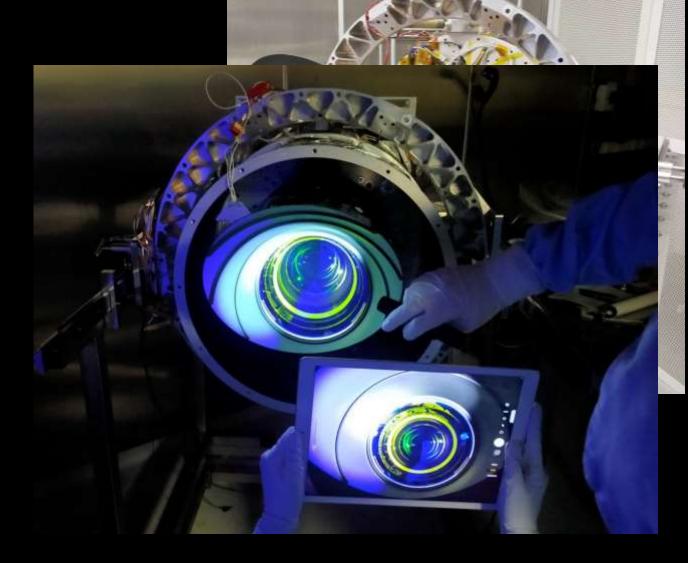


A camera - full refractive 6 lens design











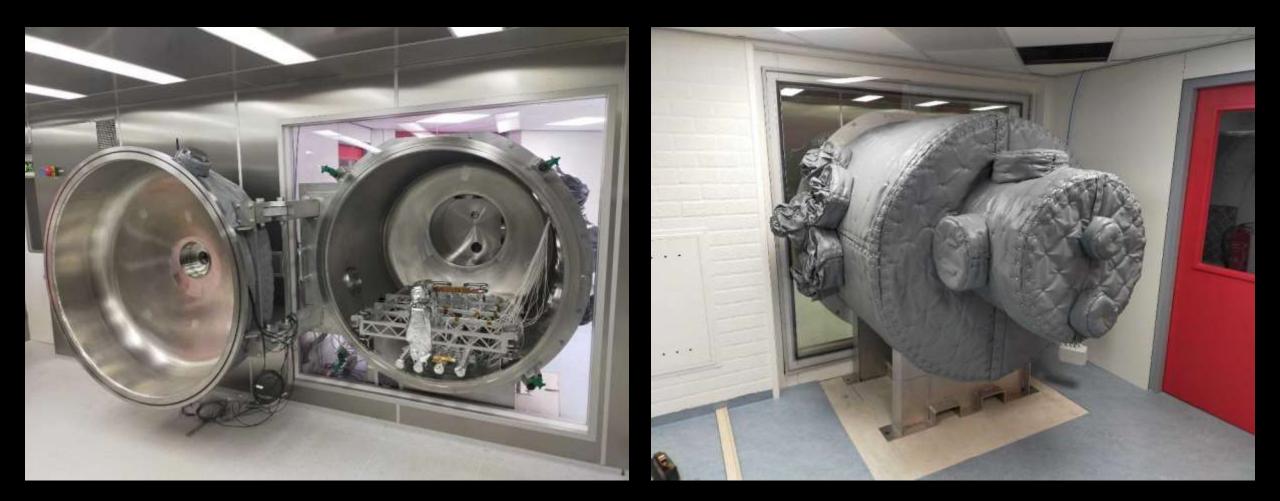




CAMERA CHARACTERIZATION AND QUALIFICATION

@SRON

PLATO thermal/vacuum tank





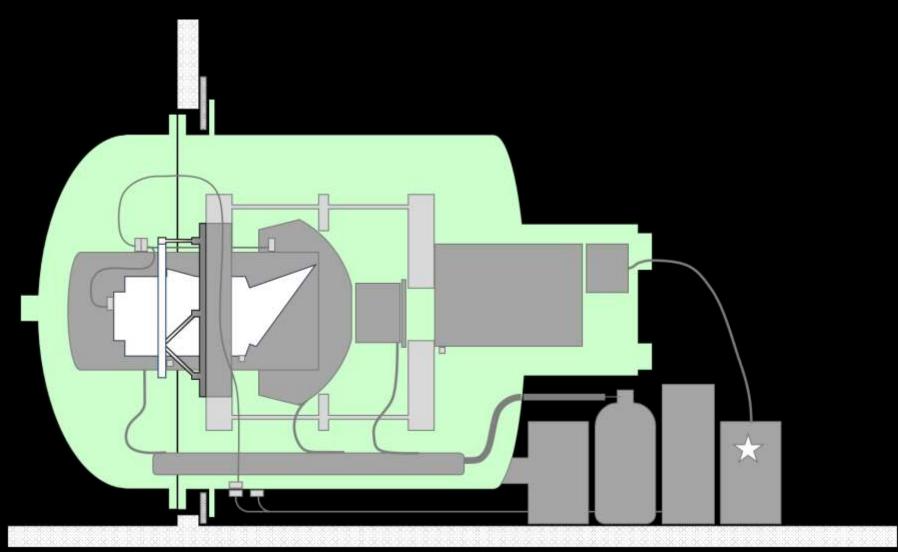
Positioner

Starsimulator



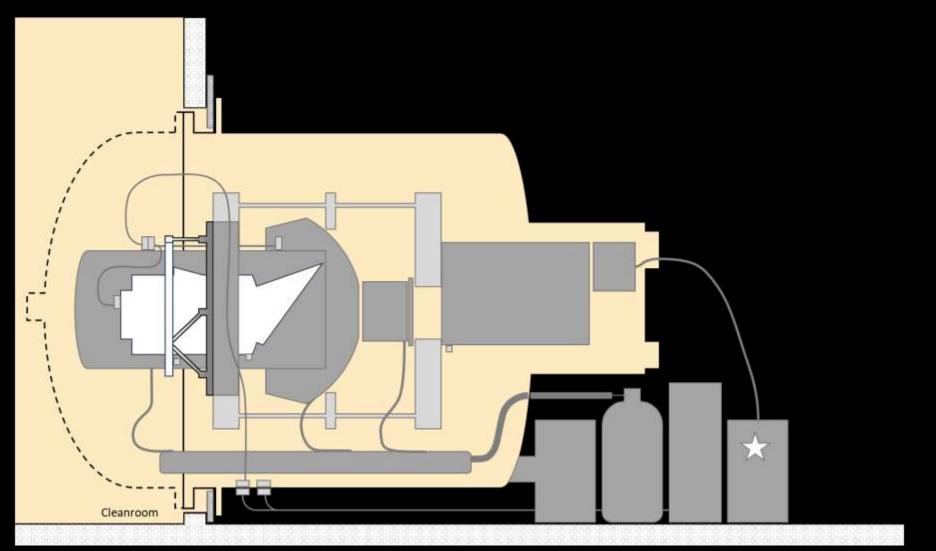
Netherlands Institute for Space Research

Vacuum regime



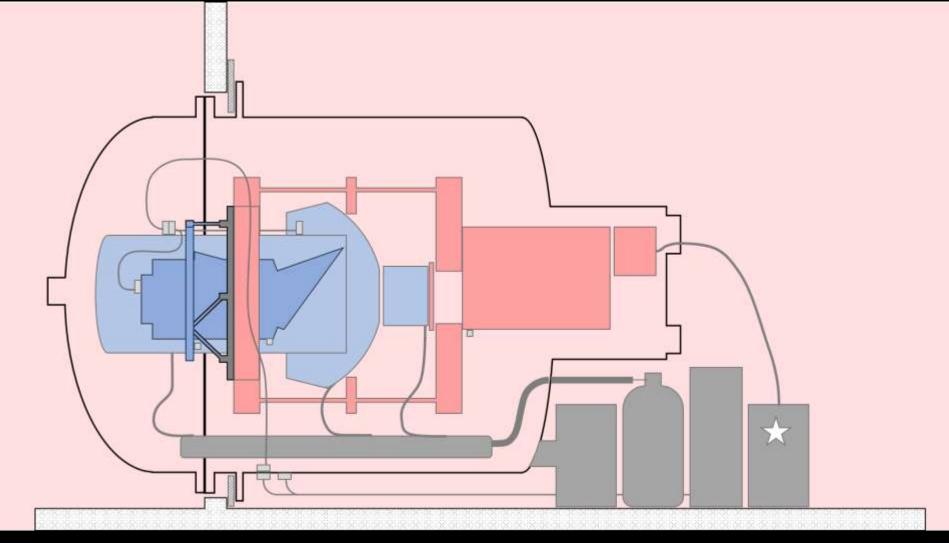


Contamination control



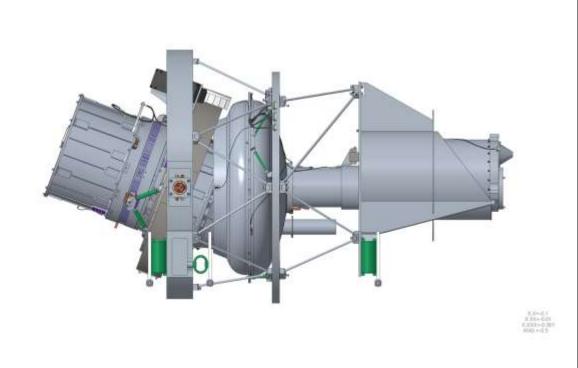


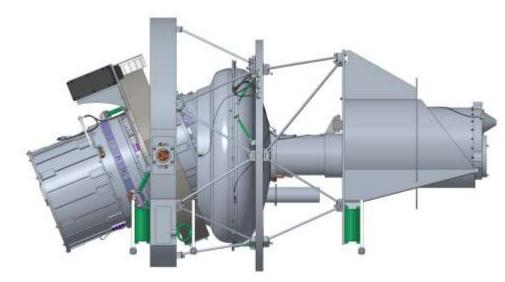
Thermal regime





Positioner motion to cover the full FoV

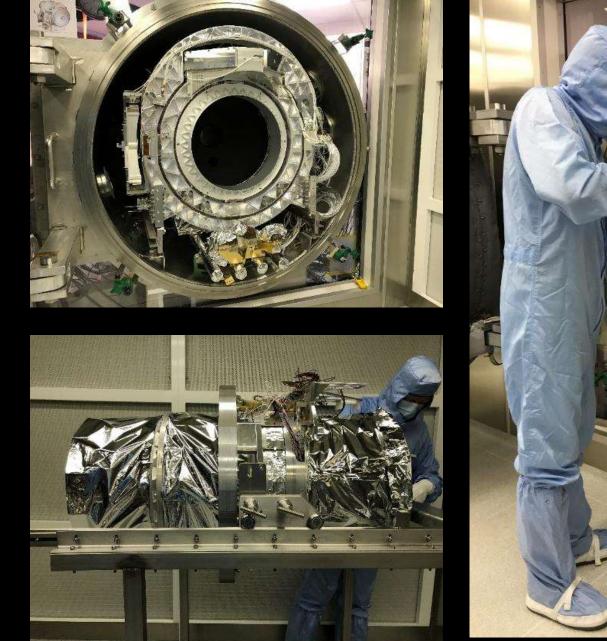






3.3(=4)) 3.3(1)=0.04 3.3(2)=0.001 4045+0.5

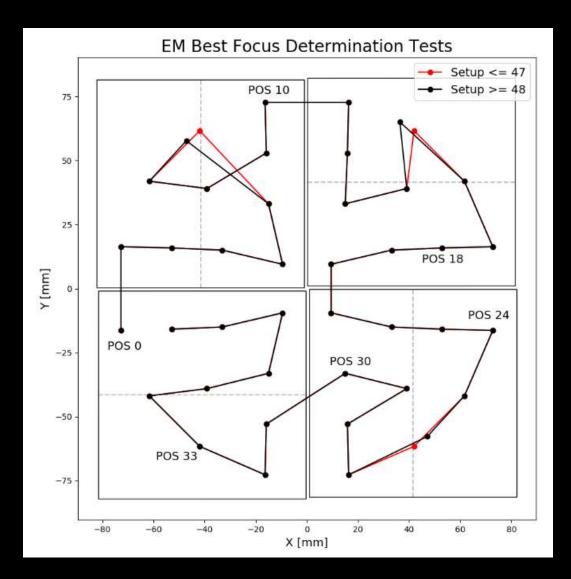
PLATO set-up





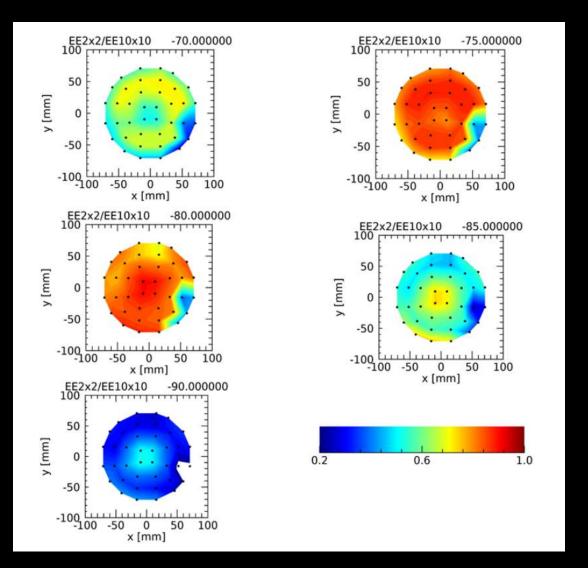


Best focus point pattern



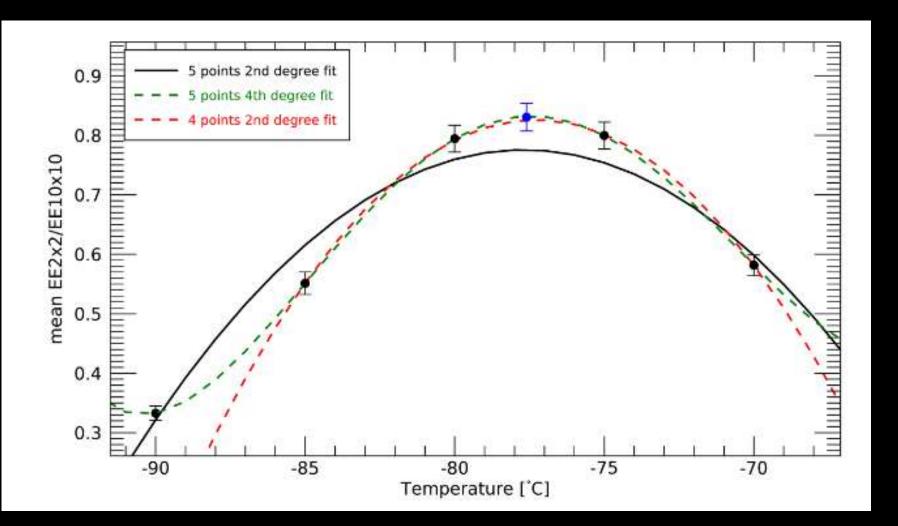


EM (Engineering Model) results at 5 temp plateaus





Determining the best focus temperature





Future



