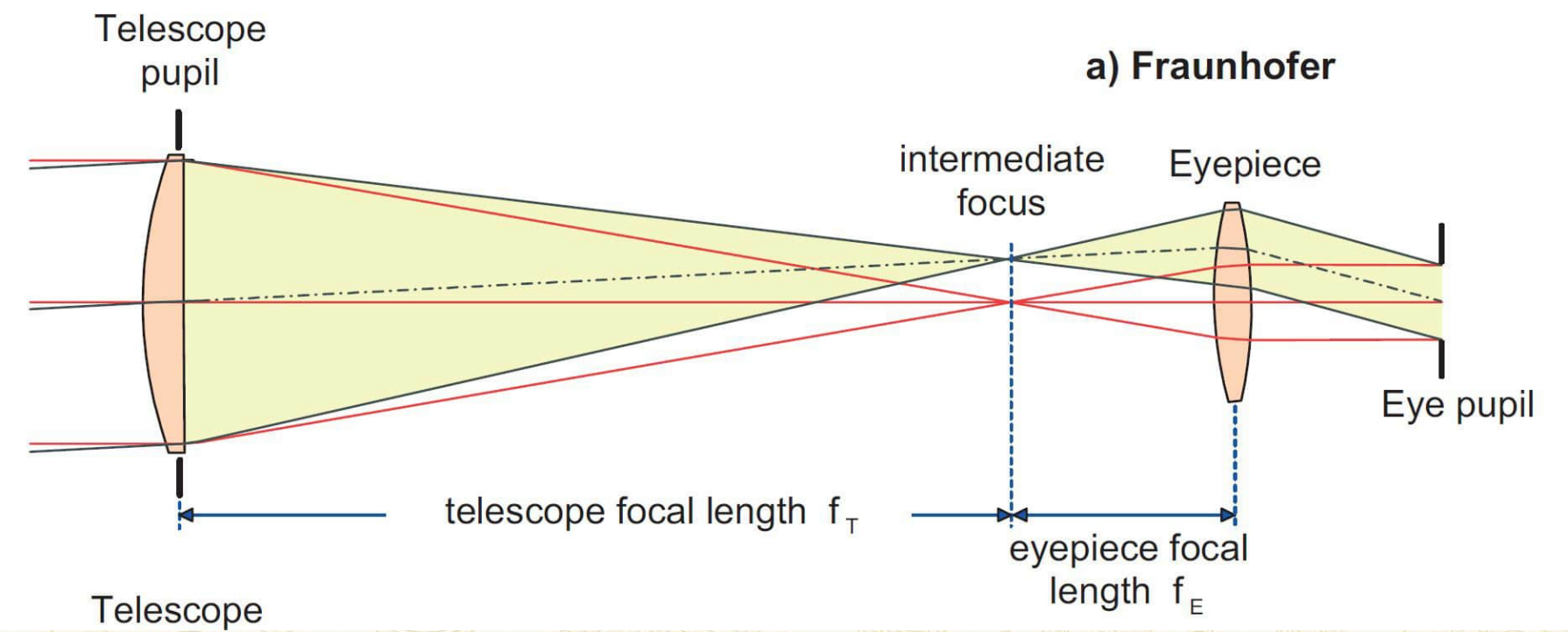
6 mm lähtöpupillin metsästys: Itse tehty okulaari pitkille putkille

Laitepäivät 2025, Tähtikallio

Lauri Kangas

Okulaarien perusteita

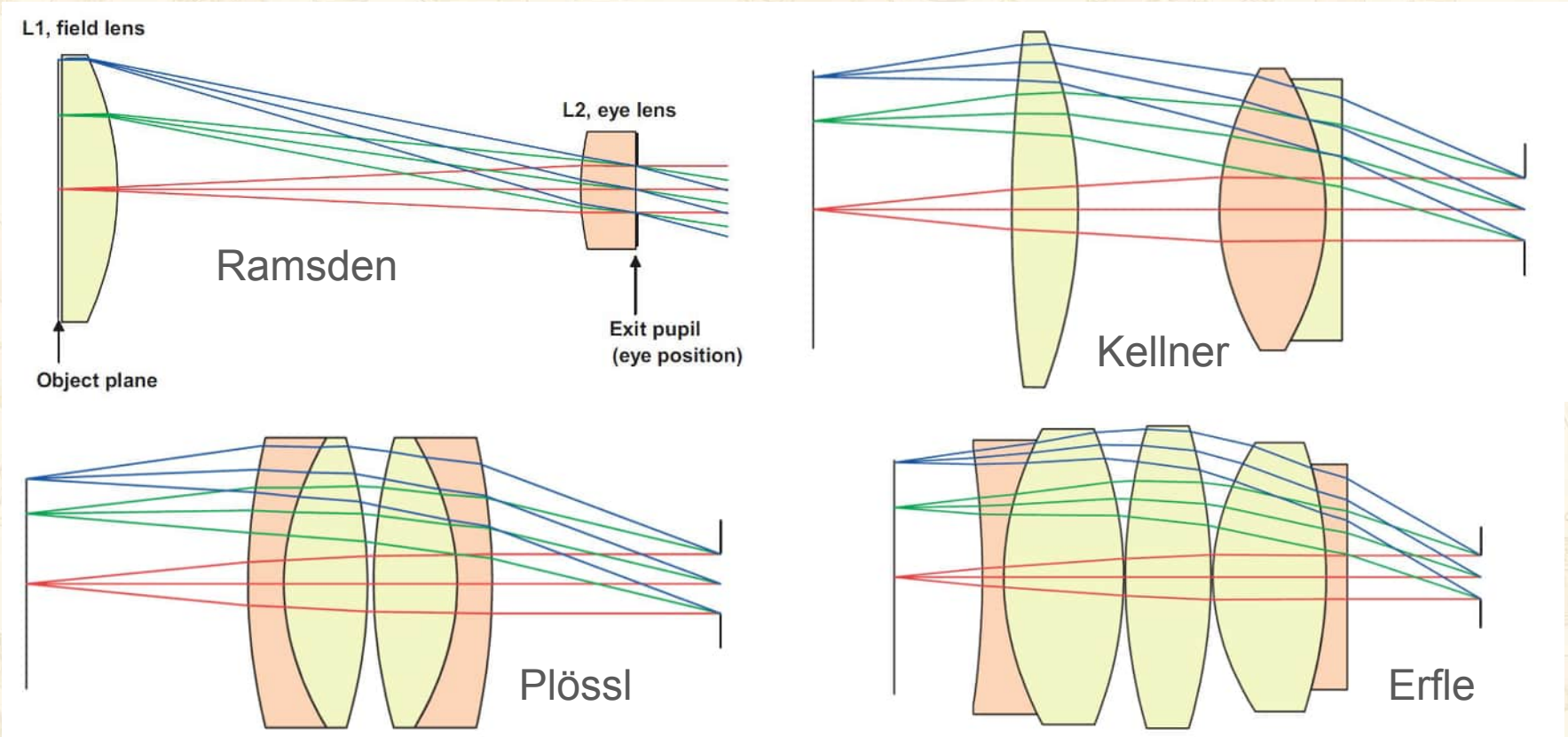


Aukkosuhde - Suurennus - Lähtöpupilli - Silmäväli - Näkökentät

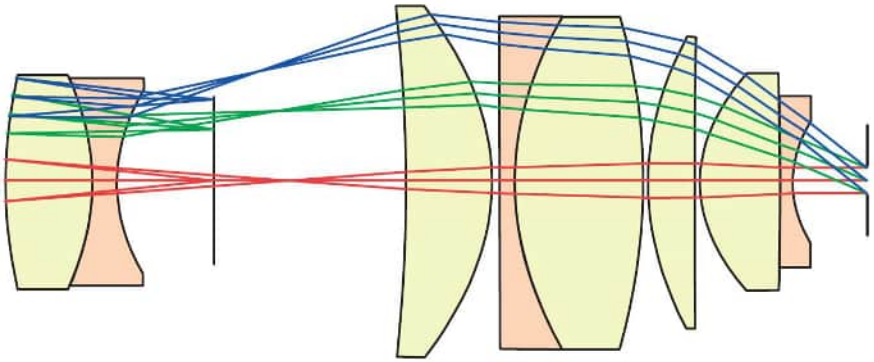
Lähtöpupilli

Okulaarityyppejä

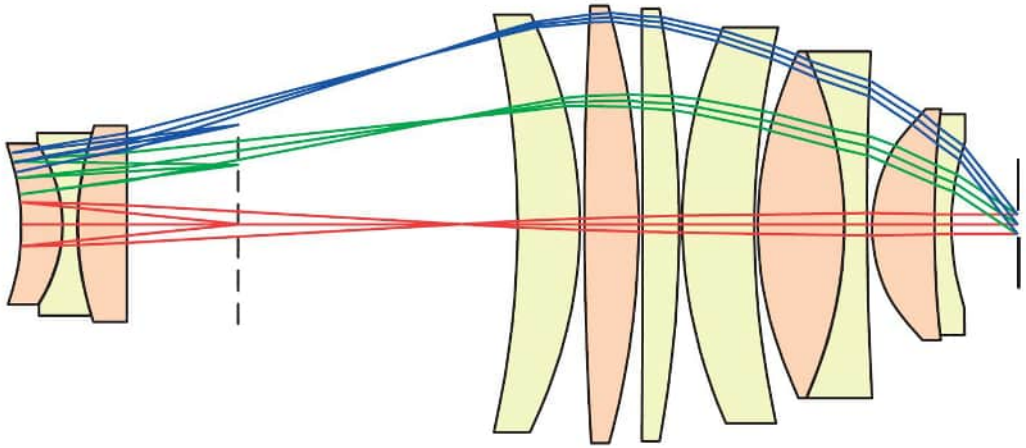
Kuvat: Herbert Gross (ed.): Handbook of Optical Systems, Volume 4 - Survey of Optical Instruments (Wiley-VCH, 2008)



Okulaarityyppejä



Nagler type 2



Köhler 110° (1959)

Okulaarit pitkän polttovälin kaukoputkissa

CPC 1100 Schmidt-Cassegrain -kaukoputki
f = 2800 mm, f/10

Esim. 32 mm 60° okulaarilla:

Suurennus 2800 mm / 32 mm = 87.5x
Pupilli 32 mm / 10 = 3.2 mm
Näkökenttä 60° / 87.5 = 0.68°

f/10:llä olisi varaa 60 mm polttovälille!

Mistä linssejä?

- Kiikareiden objektiivilinssit hyviä akromaatteja
- Tyypillisesti noin f/4 tai hieman alle
  - 7x50, 10x50: f = 180 mm
  - 8x40: f = 155 mm
  - 8x30: f = 130 mm
- Plössl-rakenteessa $f = f_{1,2}/2$
  - Silti 65-90 mm…
- Kaksi Plössliä peräkkäin? 💭

Red’s Double Plössl (RDP)

https://www.youtube.com/watch?v=iEUEvv4s3N4

https://www.youtube.com/watch?v=ySK7yQ3ohX0

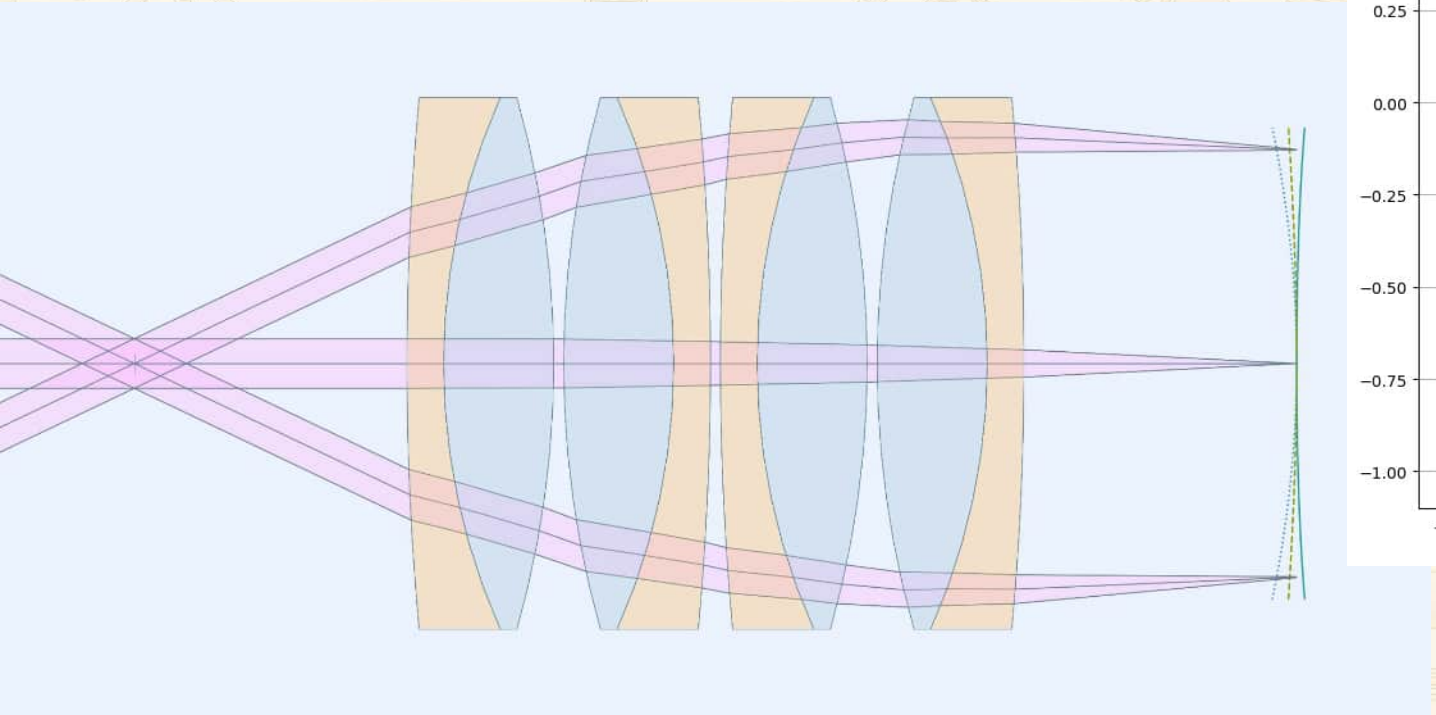
Red’s Double Plössl (RDP)

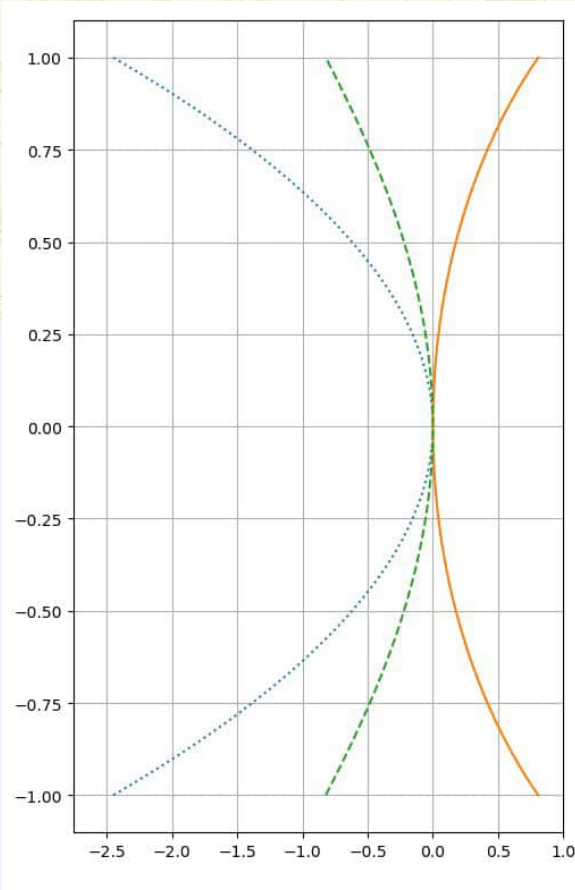
Okulaarit ja prismat

Kuvat: Red Henry

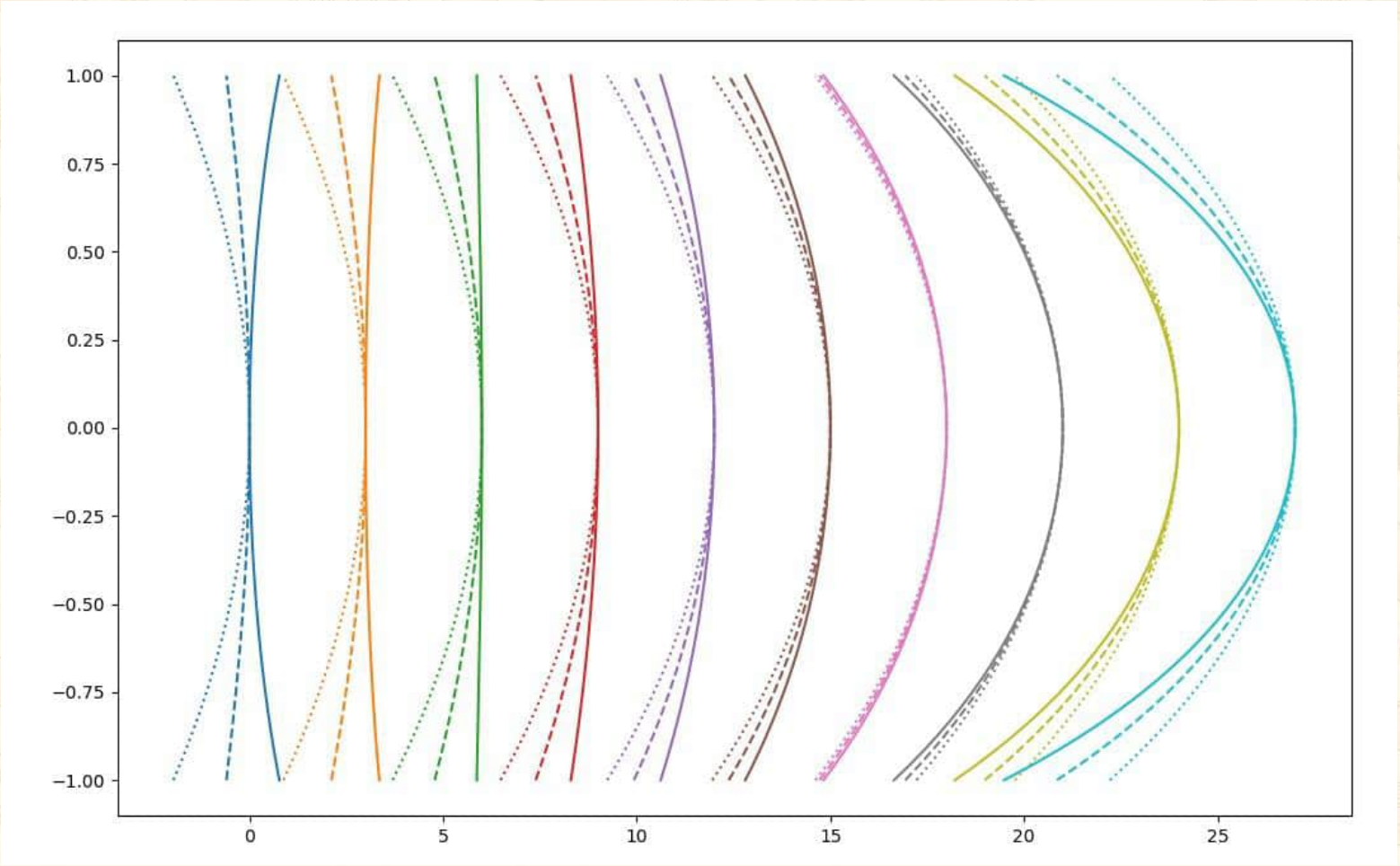
“A Second Look: Reusing Old Lenses for Astronomy” (Facebook)

Laskelmia

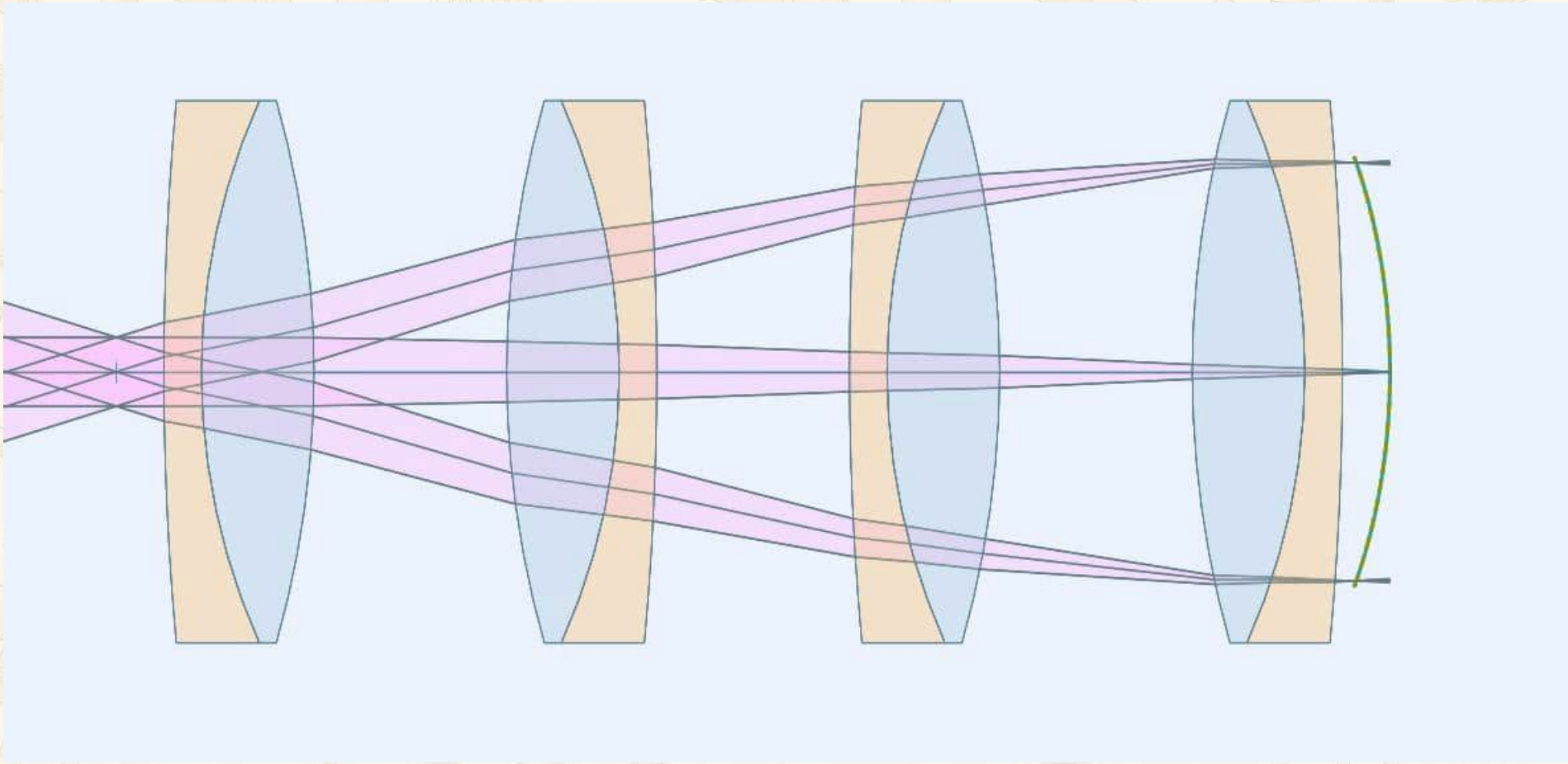




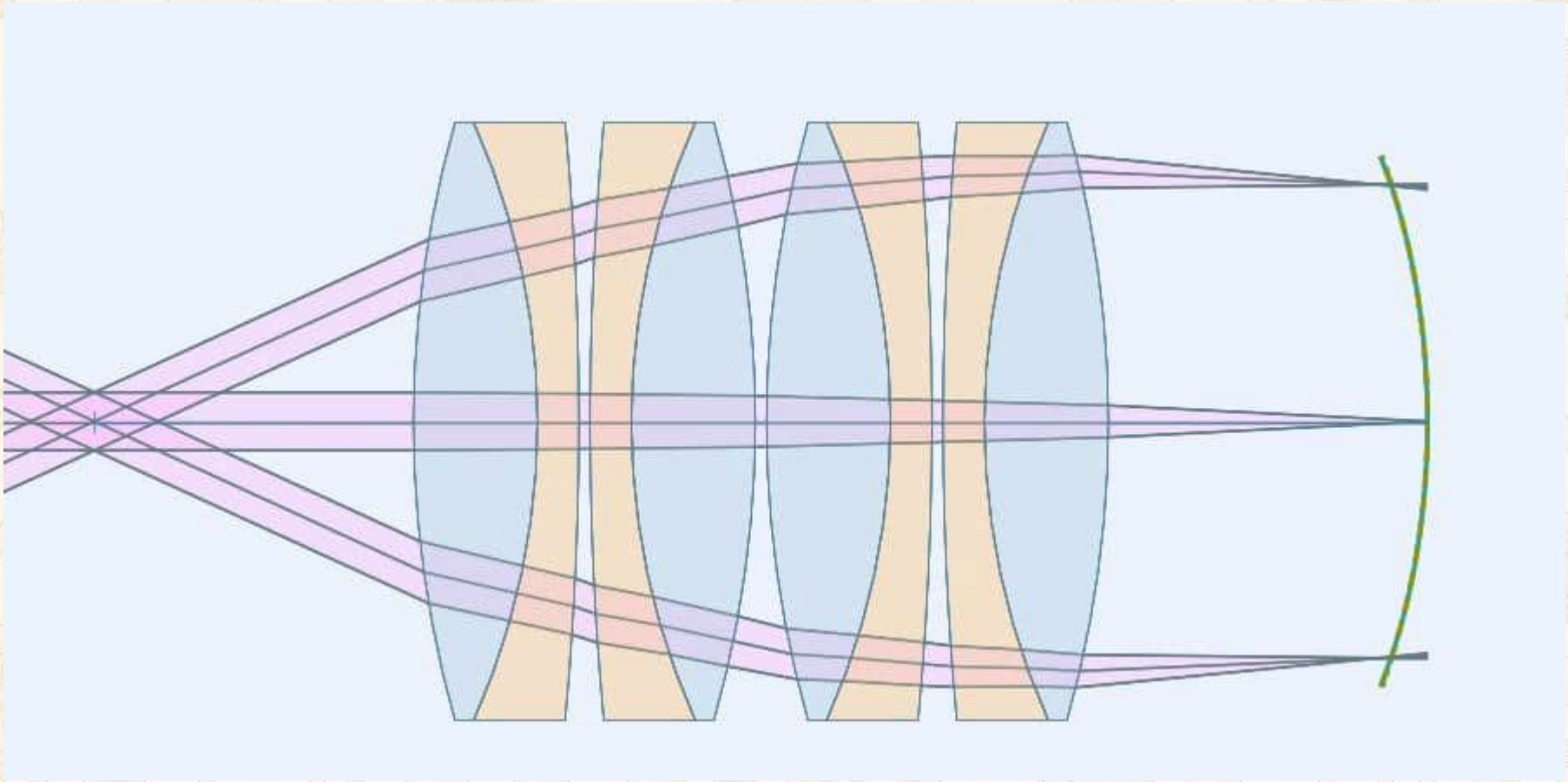
Petzval ja astigmatismi. Vapausasteet kortilla



Astigmatismista vapaa ratkaisu jokseenkin epäergonominen



Kääntelemällä linssejä löytyy toinen Petzval-ratkaisu



Onkohan joku miettinyt tätä ennenkin?

37.2.5

Field Curvature and Astigmatism

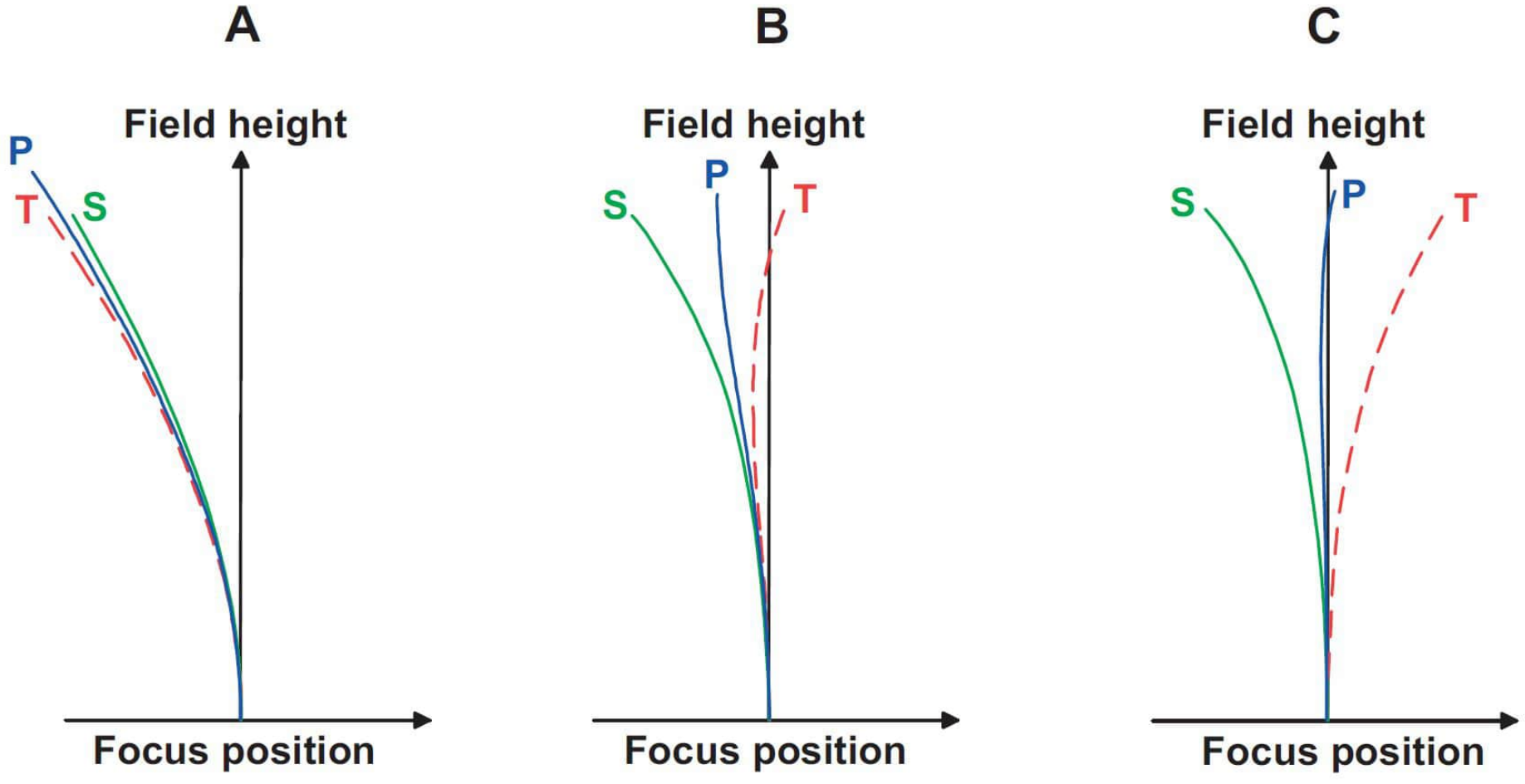
Field curvature and astigmatism are the two aberrations that are most difficult to correct in eyepieces.

Small field curvature is a primary requirement for achieving large fields. As with all imaging systems, field curvature must be treated in conjunction with astigmatism, i.e., the corresponding sagittal and tangential field curves.

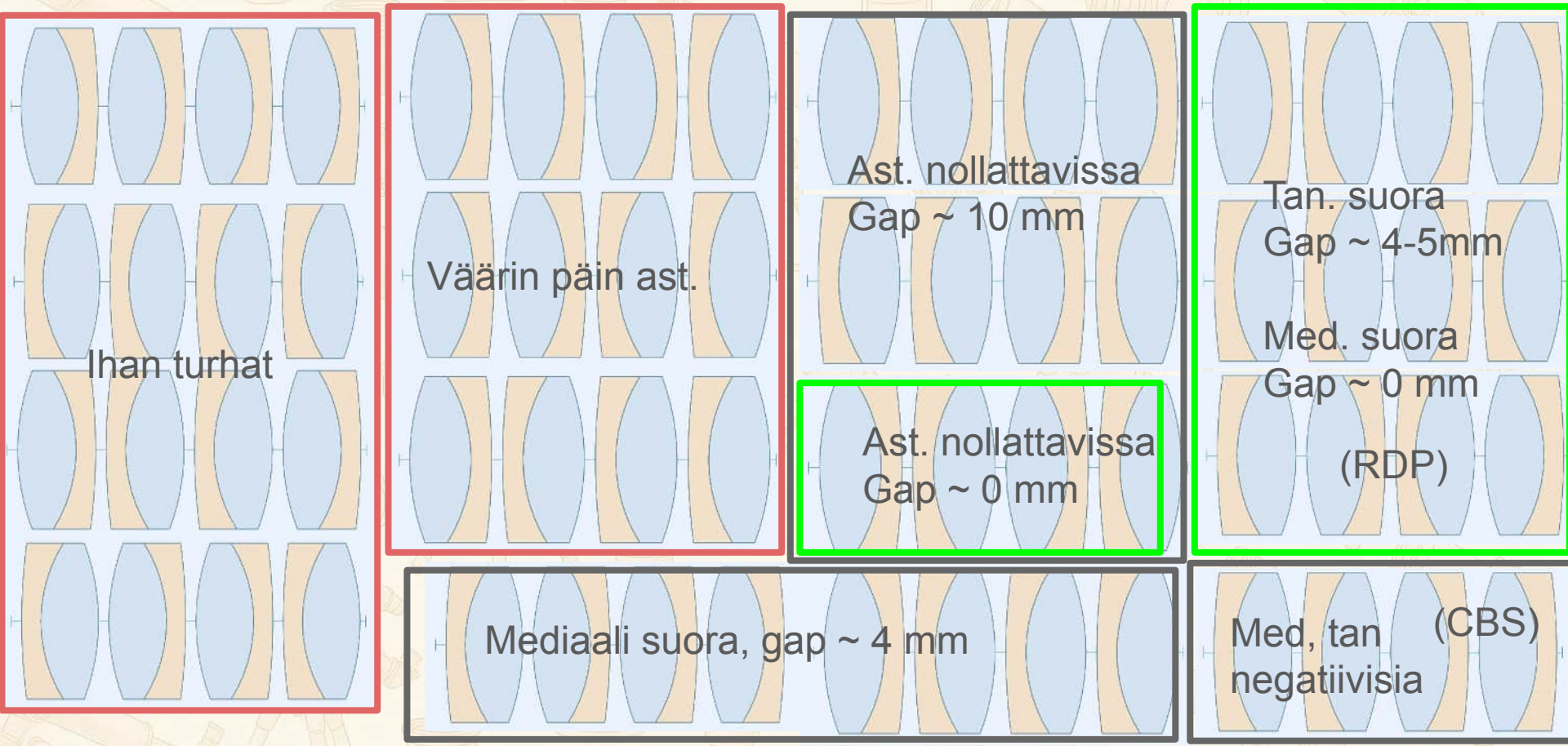
Eyepieces generally suffer from (third-order) field curvature, which is expressed in a thin-lens model by the Petzval sum

$$\sum P = \sum_{i=1}^{N} \frac{\bar{\sigma}_i}{n_i}, \tag{37-5}$$

Onkohan joku miettinyt tätä ennenkin?

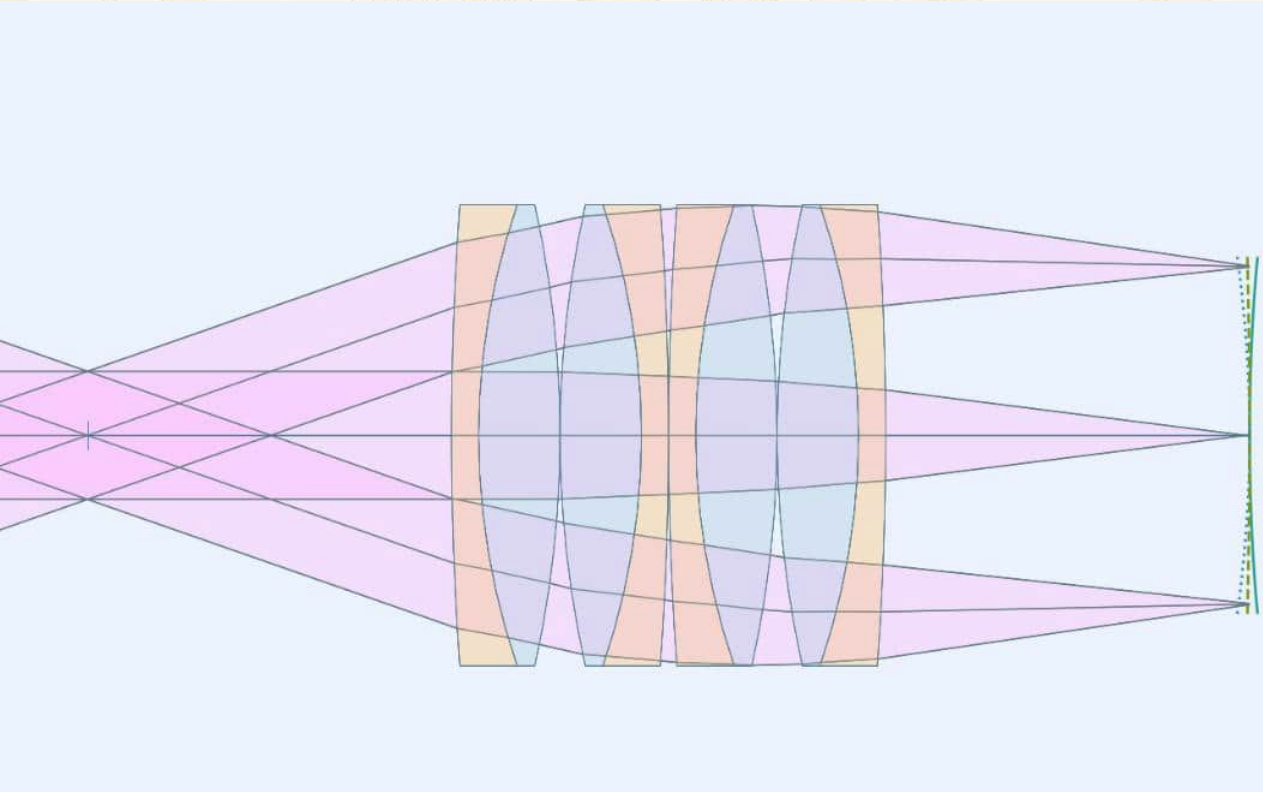


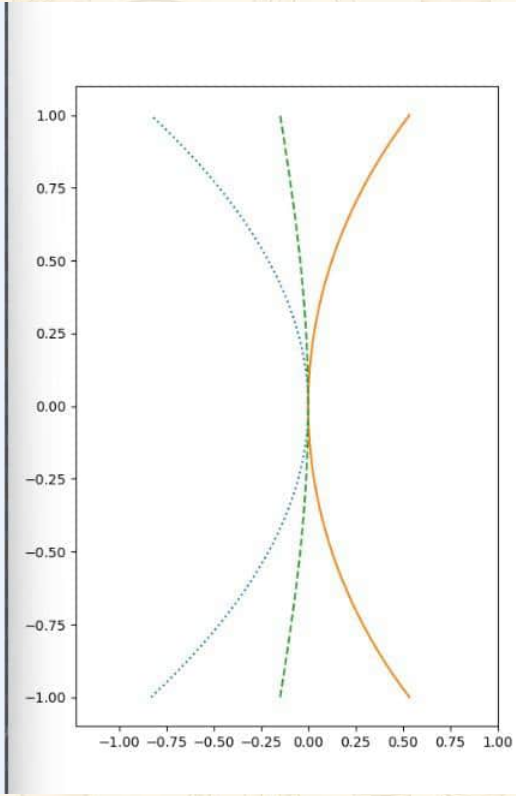
Kaikki kombinaatiot



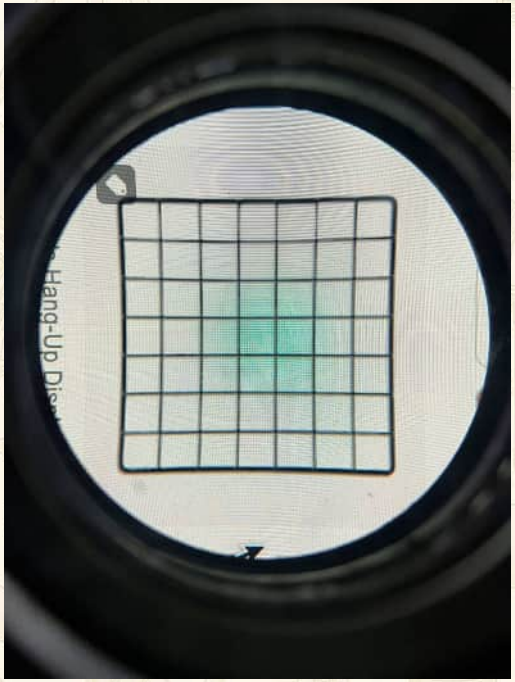
Huom! Kokeilu omalla vastuulla. Mallinnukset laadittu f/10:llä, linssin parametrit määritelty Stetson-Harrison -menetelmällä n. klo 04 aamuyöllä.

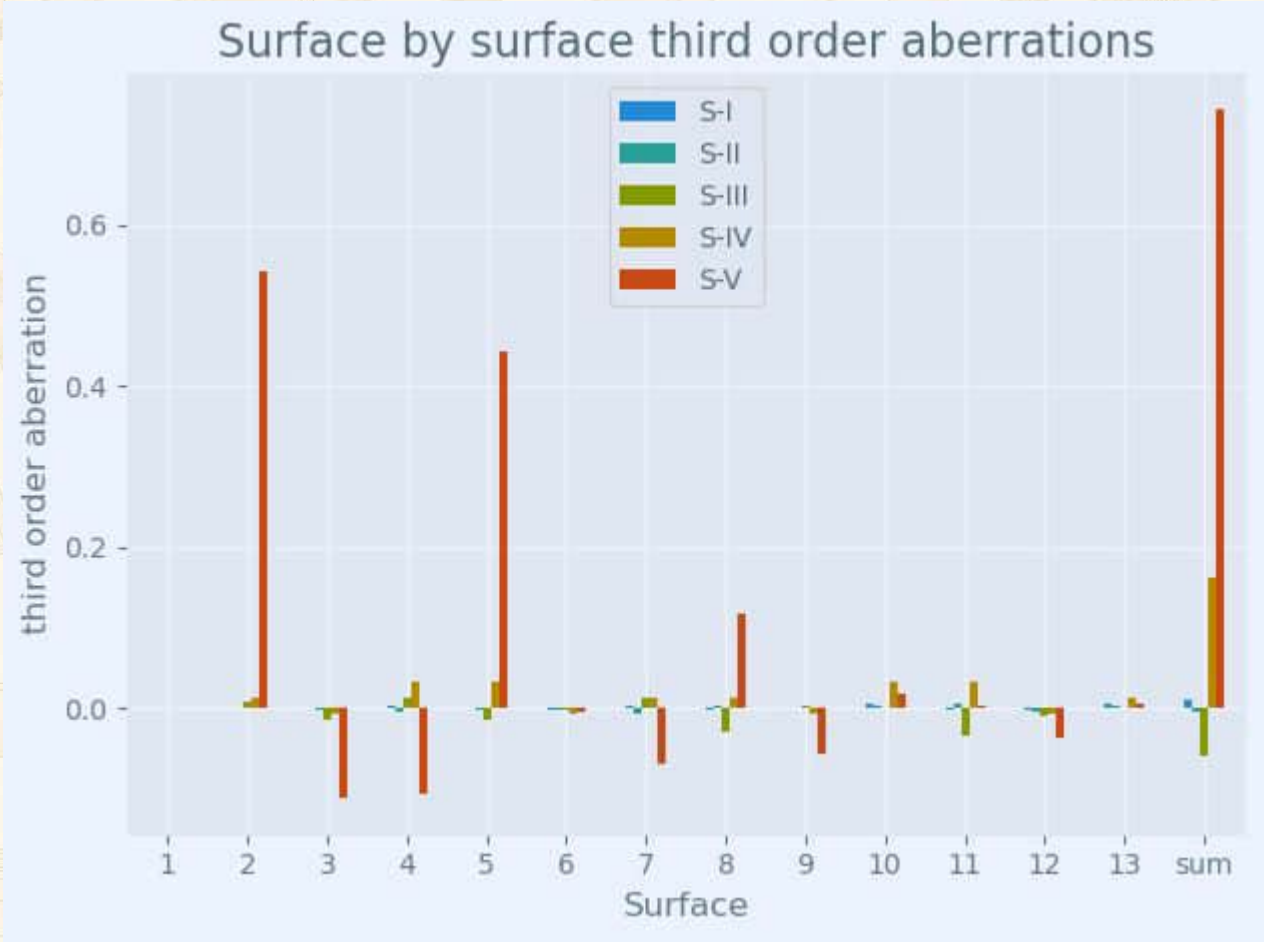
f/4 valokartio muuttaa tilannetta





Seidelin sylttytehdas



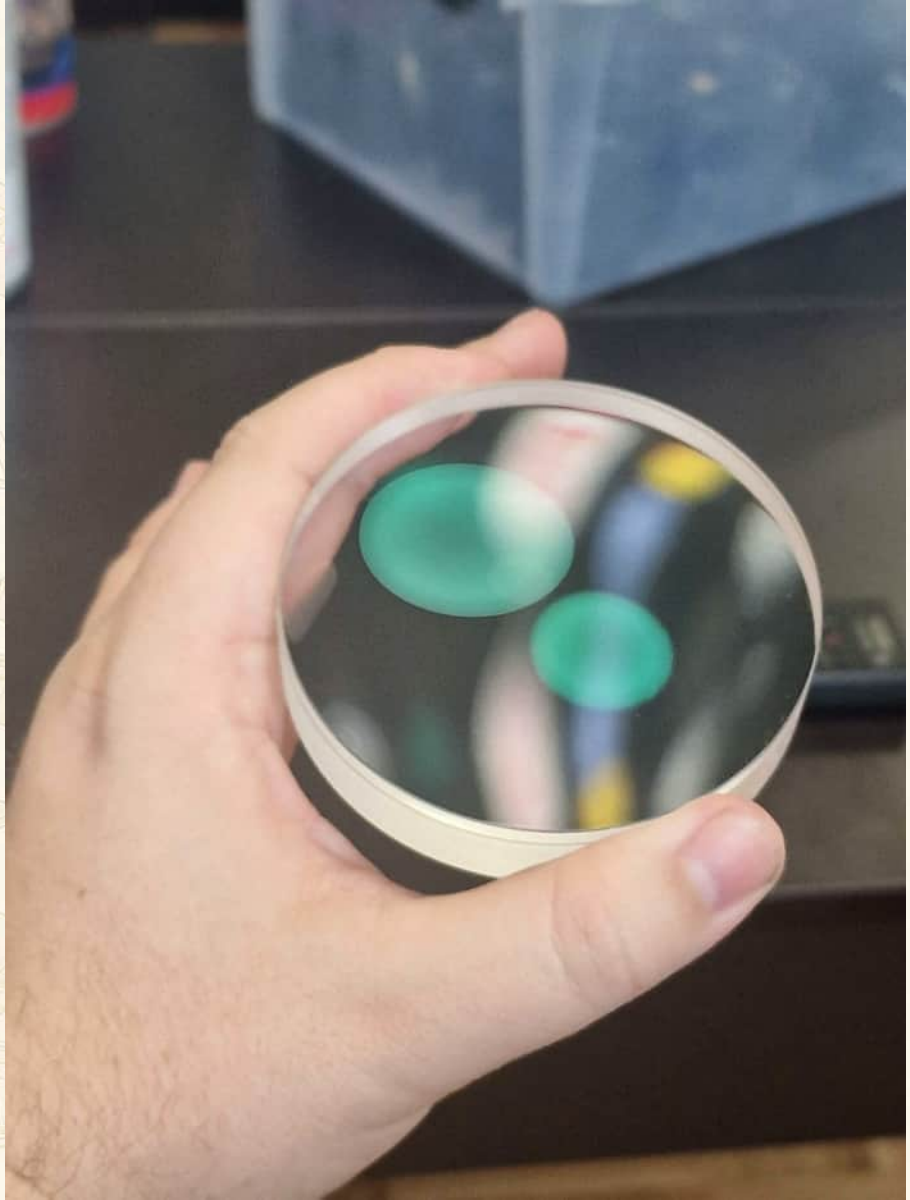


Metsästys

Nyljentä

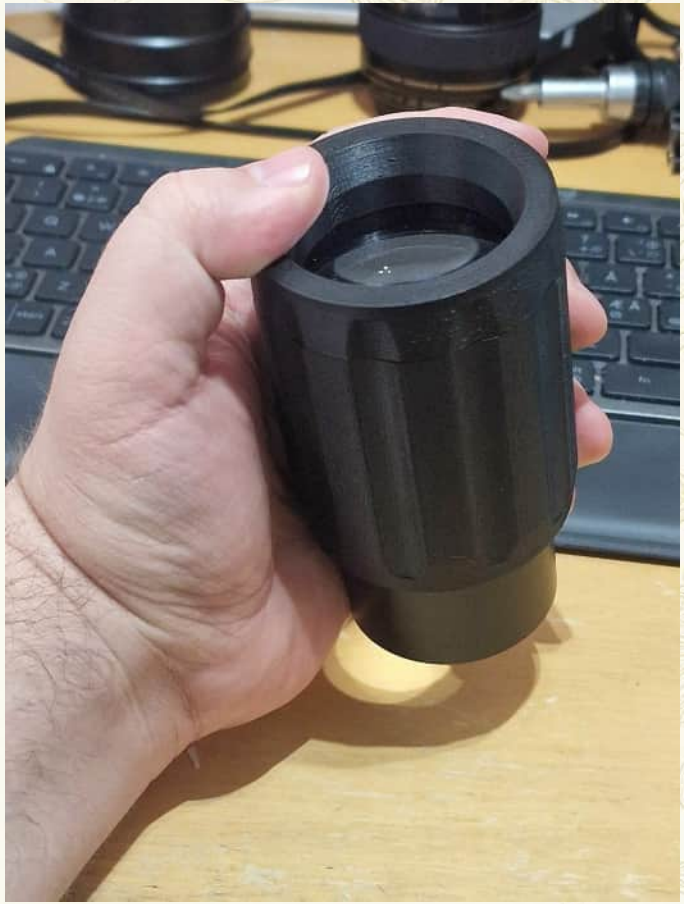
Saalis

Pinnoitteet



Ripustus

Lopputulos



Kuvat: Red Henry, Frans van Muijen, Steve Case, Tom Jonnes

Kirjallisuutta

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