

STARGAZER V1

ANALYSIS OF OPTICAL PHENOMENA (GROUP 101)

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EQUIPO

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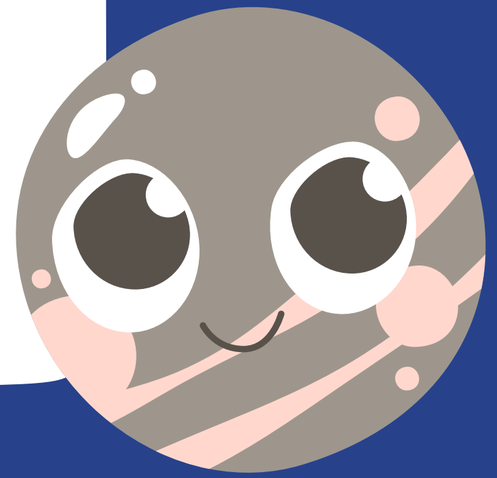
INTRODUCTION

- What is a telescope?
- Who was Hans Lippershey?
- Who was Newton?



THEORETICAL FRAMEWORK

NEWTONIAN TELESCOPE

It consists of a curved mirror to focus light from distant objects that emit parallel rays, which are reflected on the mirror toward another one that directs the light to the eyepiece.

MATERIALS

- Plane mirror
- Concave mirror
- Eyepiece

DESIGN: CALCULATIONS

Magnificación angular

$$MA = \frac{\theta'}{\theta}$$

(Ec.1)

Magnificación radial

$$MR = \frac{h'}{h}$$

(Ec.2)

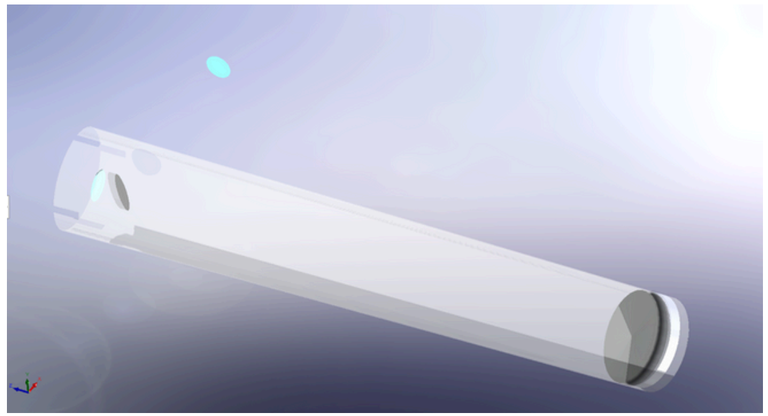
Matriz de transferencia:

$$\begin{pmatrix} \frac{-d+f}{f} & \frac{-(Ld)+Lf+df}{f} \\ \frac{-F+d-f}{Ff} & \frac{-(FL)+Ld+Ff\div Lf-df}{Ff} \end{pmatrix} \equiv$$

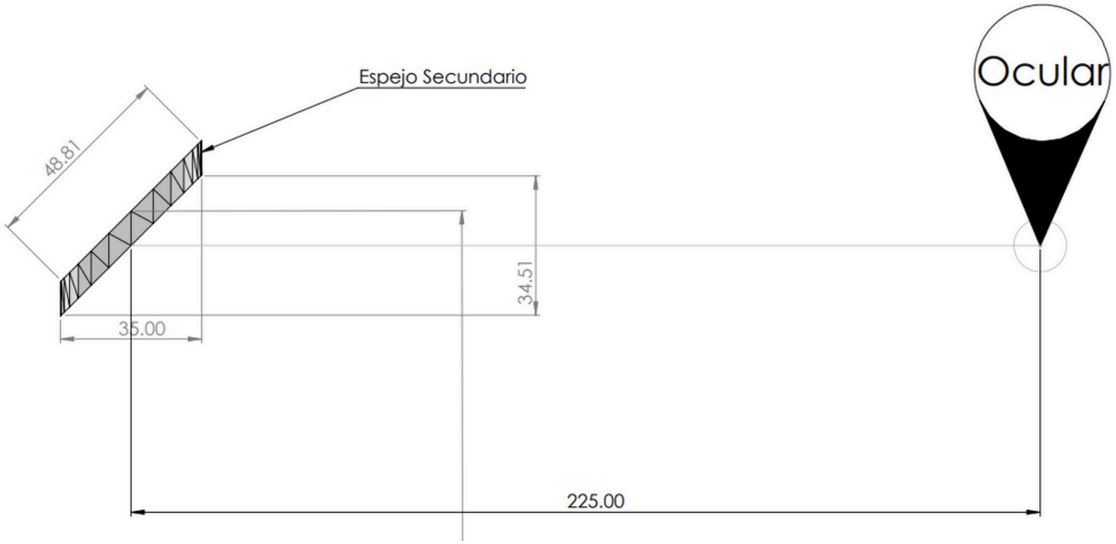
COMSOL

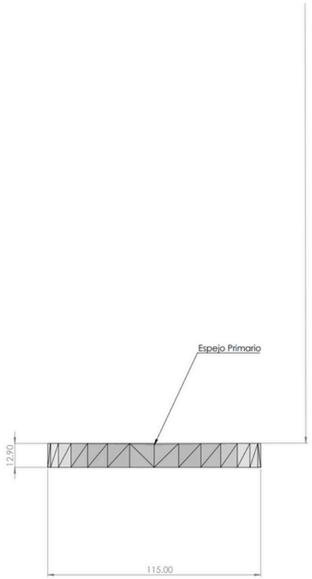
DESIGN: DIMENSIONS

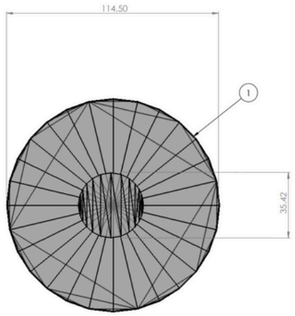
Name	Expression	Value	Description
nix	0	0	Global optical axis, x-component
niy	0	0	Global optical axis, y-component
niz	1	1	Global optical axis, z-component
d_pupil	112[mm]	0.112 m	Entrance pupil diameter
f	900[mm]	0.9 m	Primary mirror focal length
k	-1.0	-1	Primary mirror conic constant
F	f/d_pupil	8.0357	Primary mirror focal ratio
f_image	225[mm]	0.225 m	Image plane position (relative to optical axis)
d_sec	f_image/F	0.028 m	Secondary mirror diameter (projected)
delta_sec	sqrt(2)*d_sec*...	0.0012319 m	Secondary mirror offset (relative to optical axis)
d_image	d_sec	0.028 m	Image plane diameter
d_clear	0	0	Primary mirror clear diameter (use full mirror surface)
d1_prim	114[mm]	0.114 m	Primary mirror surface diameter
d0_prim	115[mm]	0.115 m	Primary mirror full diameter
Tc_prim	12[mm]	0.012 m	Primary mirror thickness
Tc_sec	6[mm]	0.006 m	Secondary mirror thickness



DESIGN: PLANE



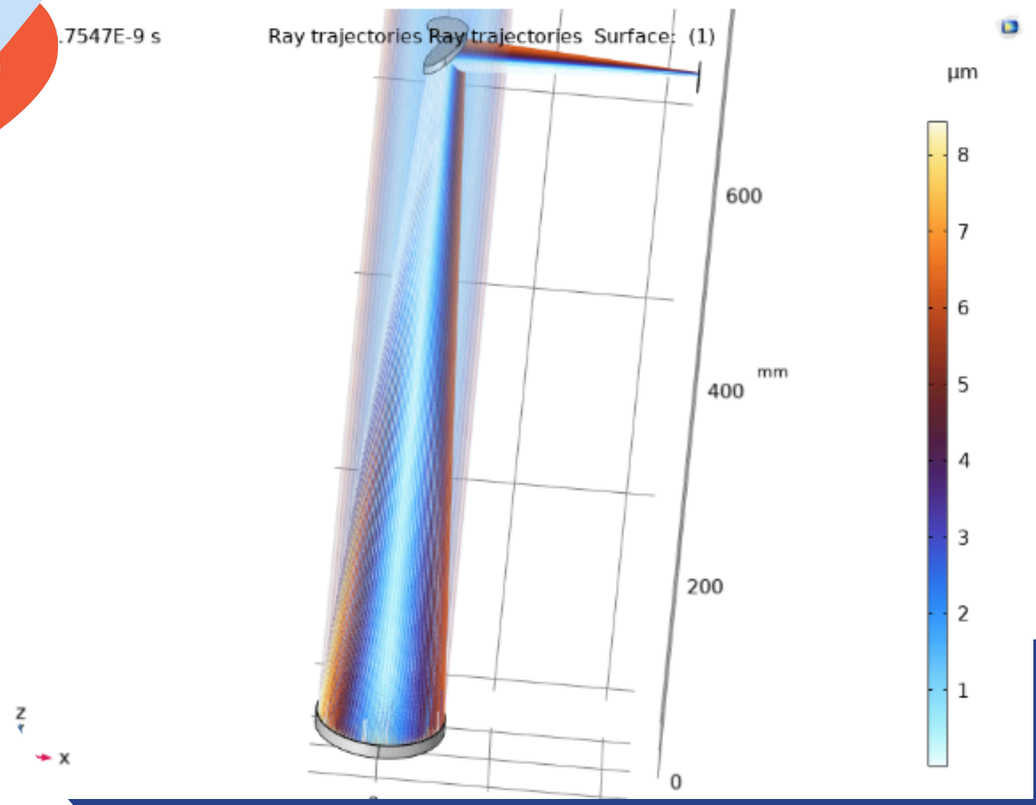


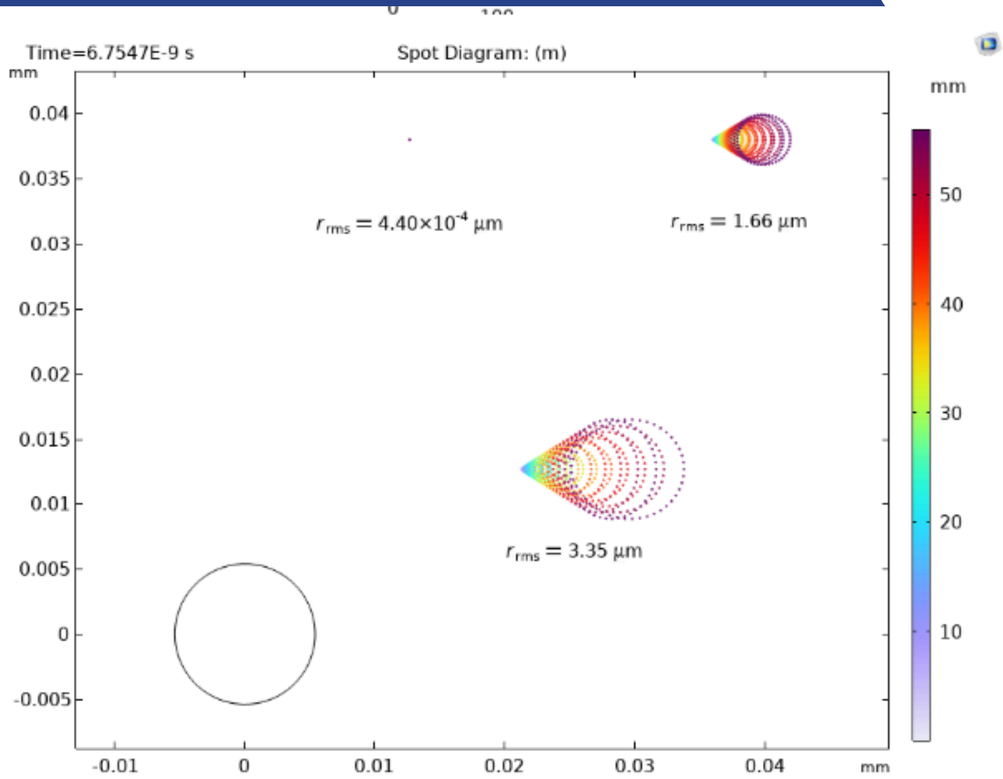


Telescopio Dimensiones

h4xter - A01067367

DESIGN: RAY TRACING





DESIGN: CONSTRUCTION

01

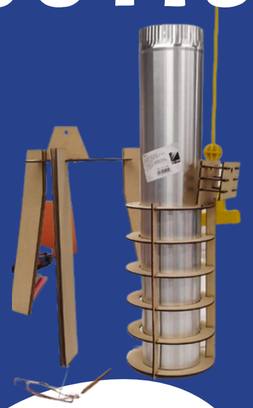
SolidWorks Design of the Telescope and Mount

02

Procurement of Required Materials

03

Cutting MDF, assembly, and redesign

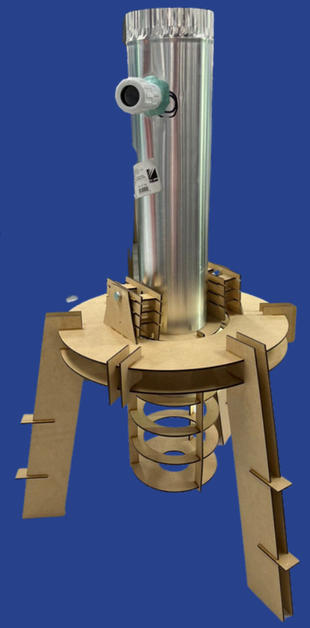


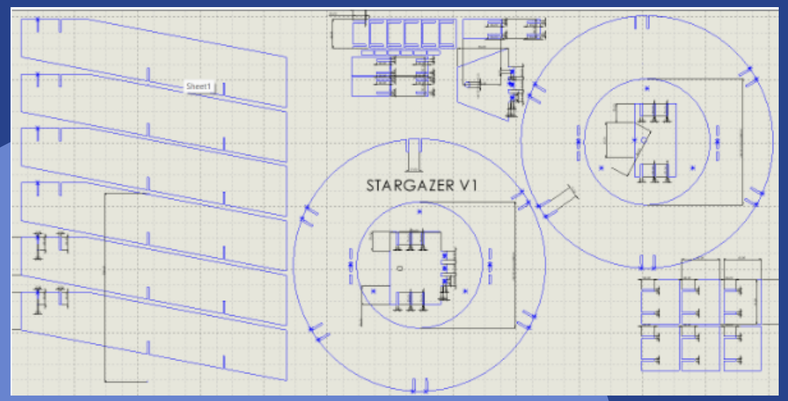
04

Assembly of the mount and the base of the telescope

05

Add the mirrors and final details





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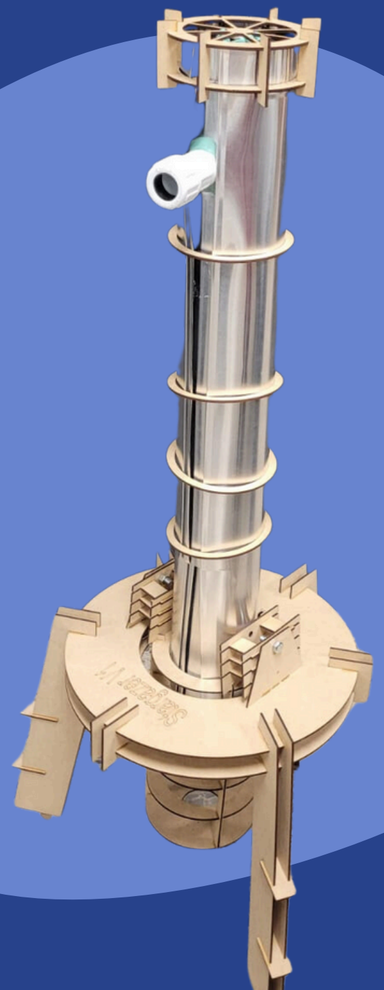
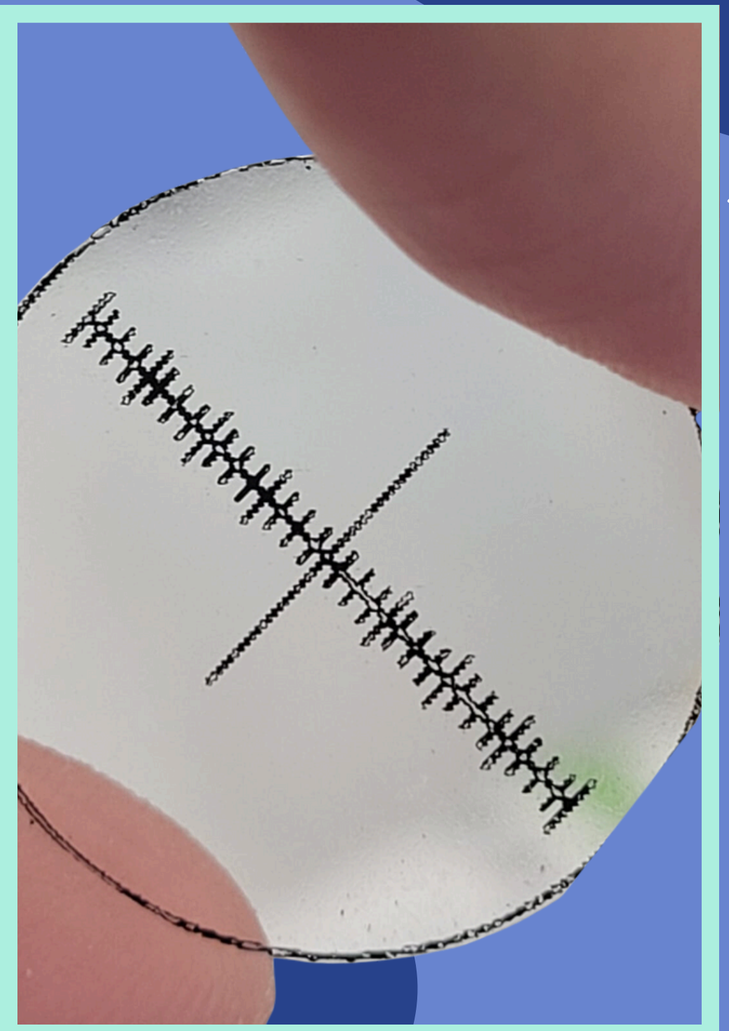


RESULTS



n order to focus our eyepiece on an object, it was necessary to have a distance of approximately 78 cm between the concave mirror and the plane mirror; between the plane mirror and the eyepiece, about 20 cm. Using the formula for transverse magnification:

$$\frac{2.5 \times 10^{-3}}{-.27} = -9.26 \times 10^{-3}$$

- Distance between telescope and object: 96 m
- Height of Hecht: 27 cm – 3.5 marks
- Height of Isabella up to the knee: 130 cm – 20 marks
- Apparent distance: 2.5×10^{-3}

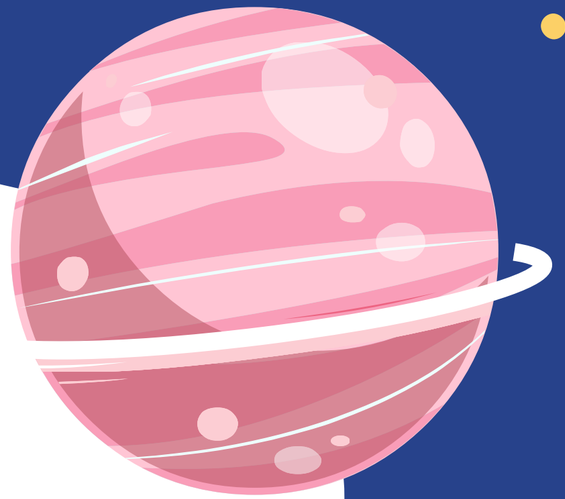
```
% Datos
f1 = 0.9;
f2 = 0.028;
L = 96.12;
d = 0.9;
re = 2*f2;
r_e = re / (L + d);

% Matrices de transferencia
A = [1 0; -1/f2 1];
B = [1 d; 0 1];
C = [1 0; -1/f1 1];
D = [1 L; 0 1];
I = [re; r_e];

% Producto de matrices
MT = A * B * C * D * I
```

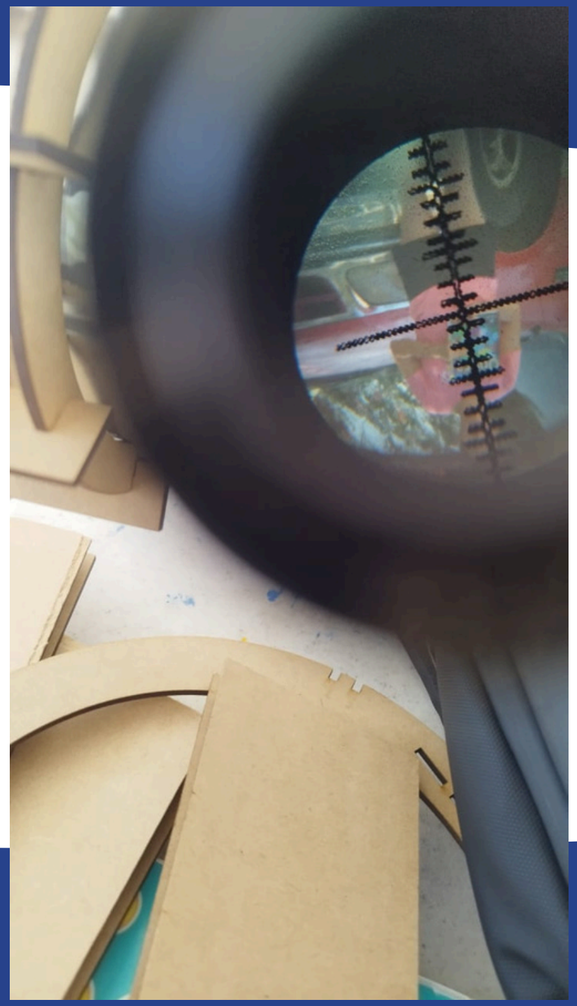
```
MT = 2×1
    0.0005
   -0.1418
```

CONCLUSIONS



- Lightweight and rigid
- Structural adaptability
- High-quality measurements
- Affordable construction cost
- The duct shows imperfections
- Low stability

REFLEXIONES



BIBLIOGRAFÍA

1. Hecht E. (2016). Optics. Pearson.
2. British Columbia Campus OpenED, n.d

THANK YOU

FOR WATCHING THIS PRESENTATION