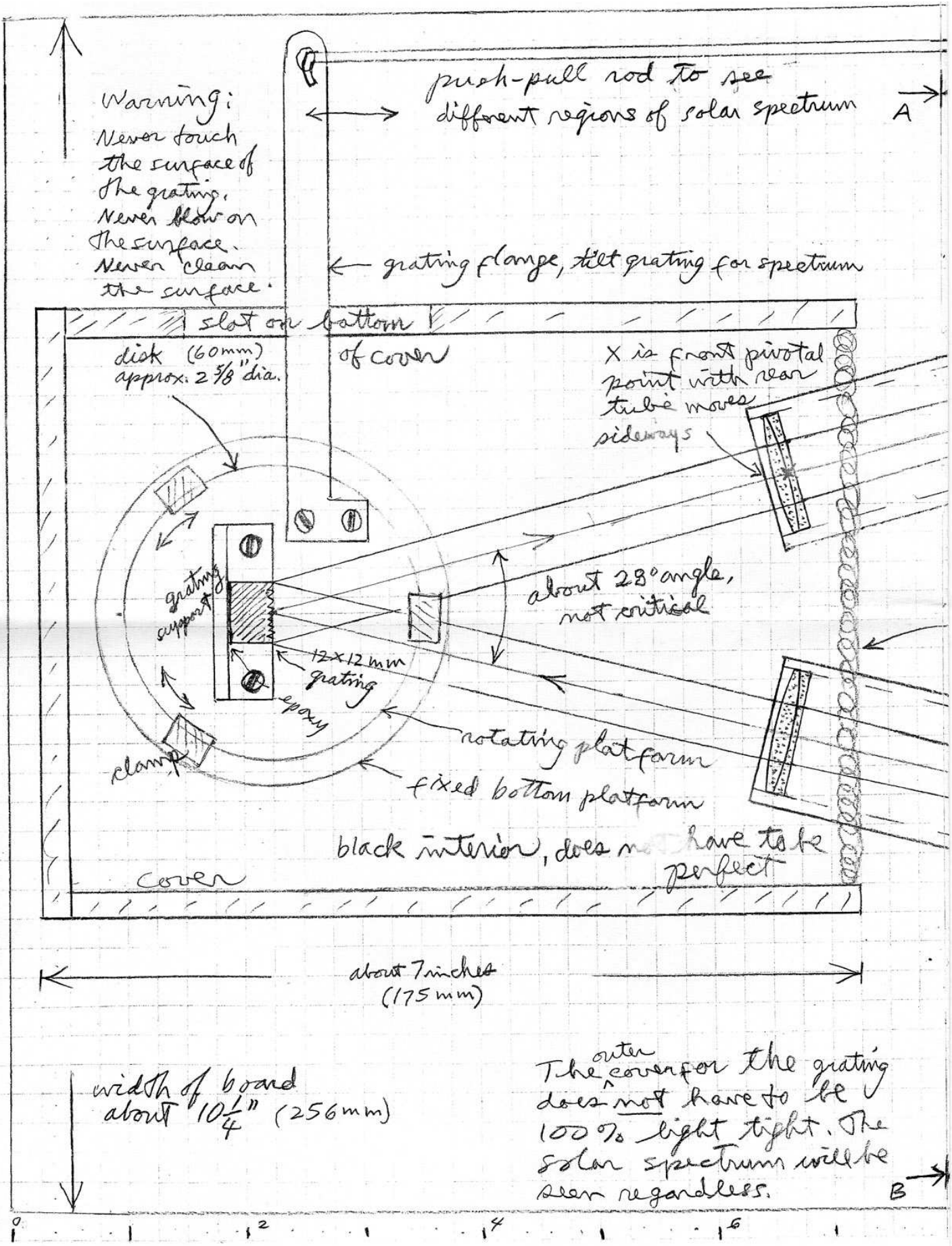
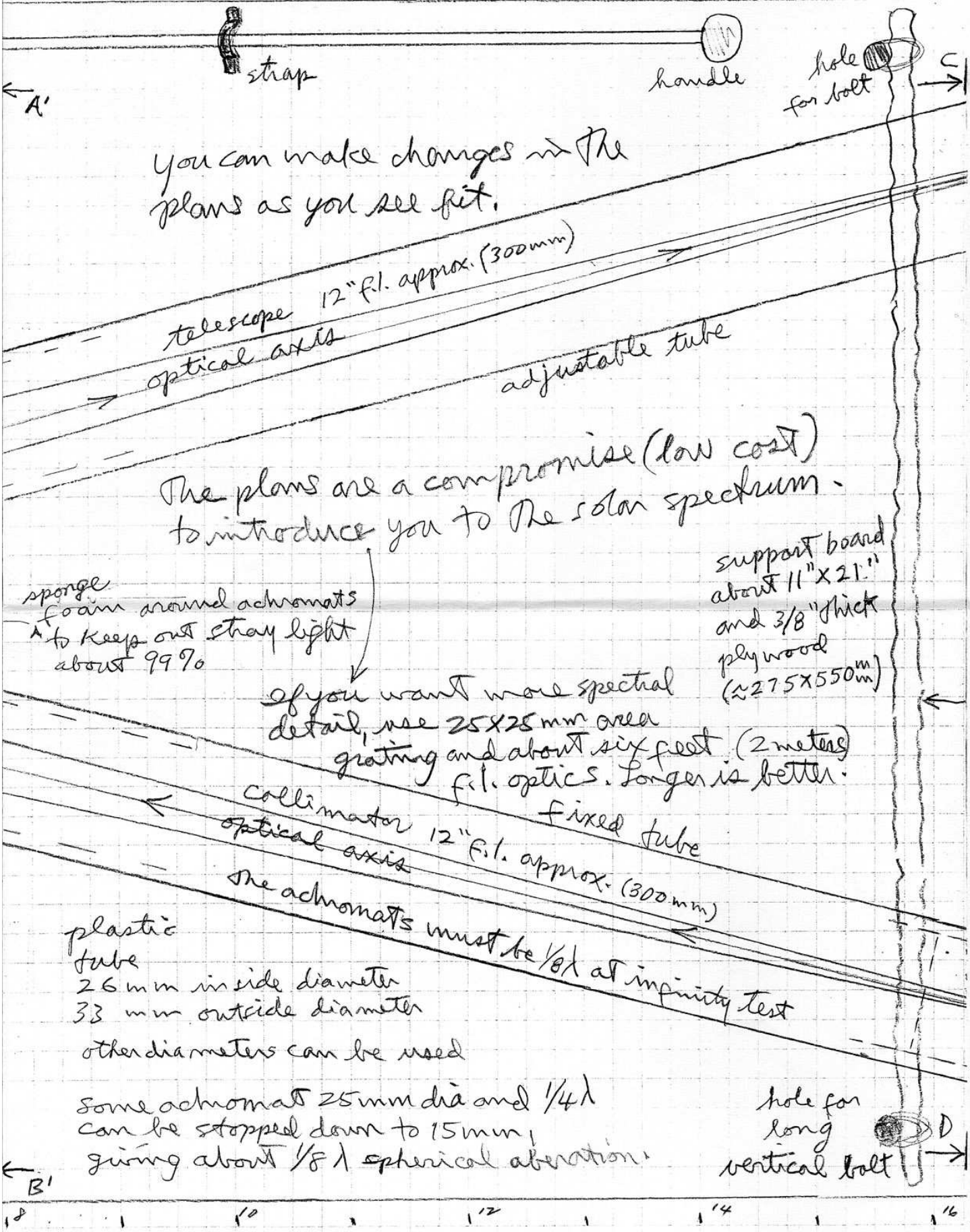
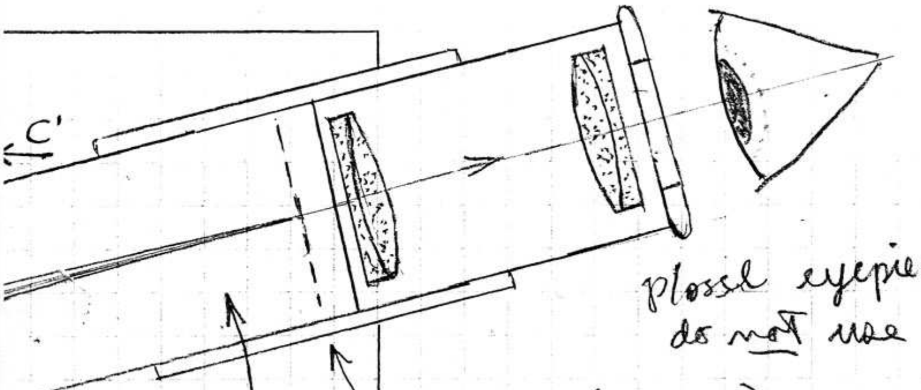

Warning:
Never touch the surface of the grating.
Never blow on the surface.
Never clean the surface.
push-pull rod to see different regions of solar spectrum
A
grating flange, tilt grating for spectrum
slot on bottom of cover
disk (60mm) approx. 2 5/8" dia.
X is front pivotal point with rear tube moves sideways
about 23° angle, not critical
grating support
12x12 mm grating
epoxy
clamp
rotating platform
fixed bottom platform
black interior, does not have to be perfect
cover
about 7 inches (175 mm)
width of board about 10 1/4" (256 mm)
The outer cover for the grating does not have to be 100% light tight. The solar spectrum will be seen regardless.
B


strap
handle
hole for bolt
C
A'
You can make changes in the plans as you see fit.
telescope 12" f.l. approx. (300mm)
optical axis
adjustable tube
The plans are a compromise (low cost) to introduce you to the solar spectrum.
sponge foam around achromats to keep out stray light about 99%
support board about 11" X 21" and 3/8" thick plywood (≈275X550mm)
if you want more spectral detail, use 25X25 mm area grating and about six feet (2 meters) f.l. optics. Longer is better.
fixed tube
collimator 12" f.l. approx. (300mm)
optical axis
the achromats must be 1/8λ at infinity test
plastic tube
26 mm inside diameter
33 mm outside diameter
other diameters can be used
some achromats 25mm dia and 1/4λ can be stopped down to 15mm, giving about 1/8 λ spherical aberration.
hole for long vertical bolt
D
B'
8
10
12
14
16



plossl eyepiece, approx 30mm to 40mm f.l., do not use high powers

approx. focus of eyepiece and telescope

rear of telescope tube moves sideways to adjust optical axis by reflection from grating, then fix in place

Solar Spectroscope ☆

Fredrick N. Veio, Calif.
July 2008

Sept 22 '08
Hi Phil,
I am OK,
a bit tired.
Cheers,
Fred

scale:
0 — 1" (25mm) — 2" (50mm)

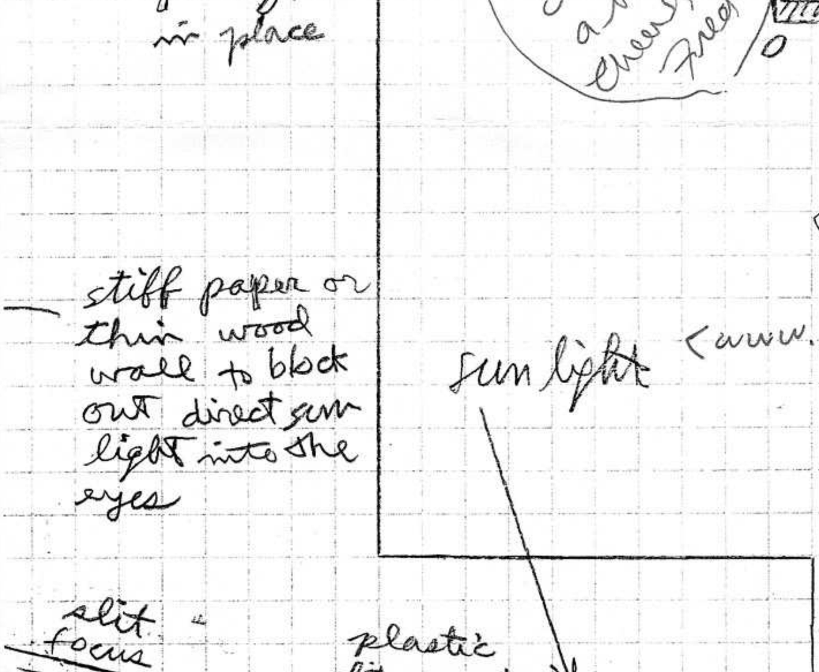
top view

stiff paper or thin wood wall to block out direct sun light into the eyes

sun light

<www.eyes-on-the-skies.org/SHS>

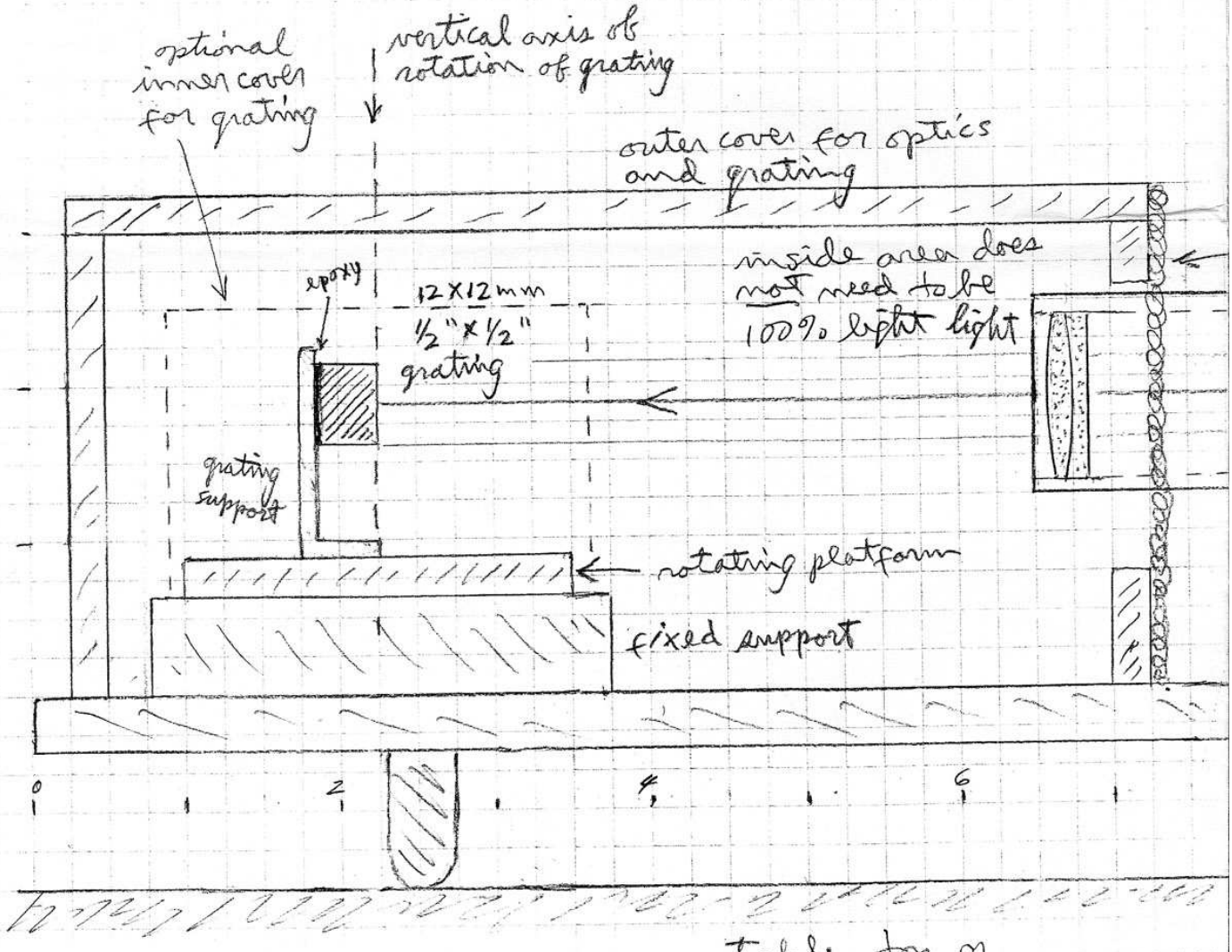
adjust entrance slit:
1. pull out mount for slit.
2. one blade fixed, other barely moves finger pressure.
3. look through mount and slit at white background (never the sun).
4. with slit closed, get no light.
5. move one slit slightly, a very narrow light slit is about 15μ (.0006 inch)
6. move slit more tiny bit, narrow slit of light, 25μ to 30μ. This is ideal.



E →

Edmund reflection gratings — 12" f.l. optics (300 mm) for spectroscope

grooves/mm	1st order linear disper	(vio. to red) solar spectrum	2nd order lin. disp.
about 1000 lines seen — 600 g./mm	48 Å/mm	3.3" long (83 mm)	24 Å/mm
1200 g./mm	24 Å/mm	6.6" (166 mm)	10 Å/mm
about 2000 spectral lines seen — 1800 g./mm	15 Å/mm	10½" (260 mm)	3 Å/mm
2400 g./mm	9 Å/mm	18" (450 mm)	——



E'

G

useful orders, comments

can produce 8 orders, only 1 to 5 useful

can produce 4 orders, only 1 to 3 useful

full 1st, vio-gr of 2nd

full 1st order (V-B-G-Y-R)

1/4" X 1/4" area (12X12 mm)

Edmund Scientific reflection gratings:

1. ruled gratings, N43-751,
   1200 g./mm, 500 nm (5000 Å)
   blazed, #58. NOTE: 25X25 mm, #96.
2. Holographic gratings:
   1200 gr/mm, VIS, N43-773, #75.
   1800 gr/mm, VIS, N43-775, #75.
   2400 gr/mm, VIS, N43-777, #75
   Note: 12.5X25 mm, #95. 25X25 mm, #120.
   50X50 mm, #265.

With medium short f.l. optics, gratings seem linear for dispersion, but only approx. With long f.l. optics and high orders, nonlinearity obvious.

comparison: a single flint 60° prism with 7" f.l. optics gives about 16 mm long spectrum, almost 500 lines.

long vertical bolt

sponge foam around front of plastic tube

collimator (make light parallel waves onto grating)

optical axis

the achromats must be 1/8 λ at infinity focus test

tube support

the sun light through the one inch tube will illuminate an area approx. 1/2" X 1/2" (12X12 mm) at the other end.

washer

support board

8 10 12 14 16

a professional solar observatory can record about 24,000 spectral lines. Most are faint. a professional spectrohelioscope can visually see about 4,000 lines. a compact spectroscope, about 2000 lines.

F'

H

← G'

- stiff paper or thin wood wall to block out direct sun light on eyes

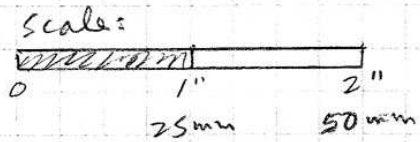
Solar spectrum regions

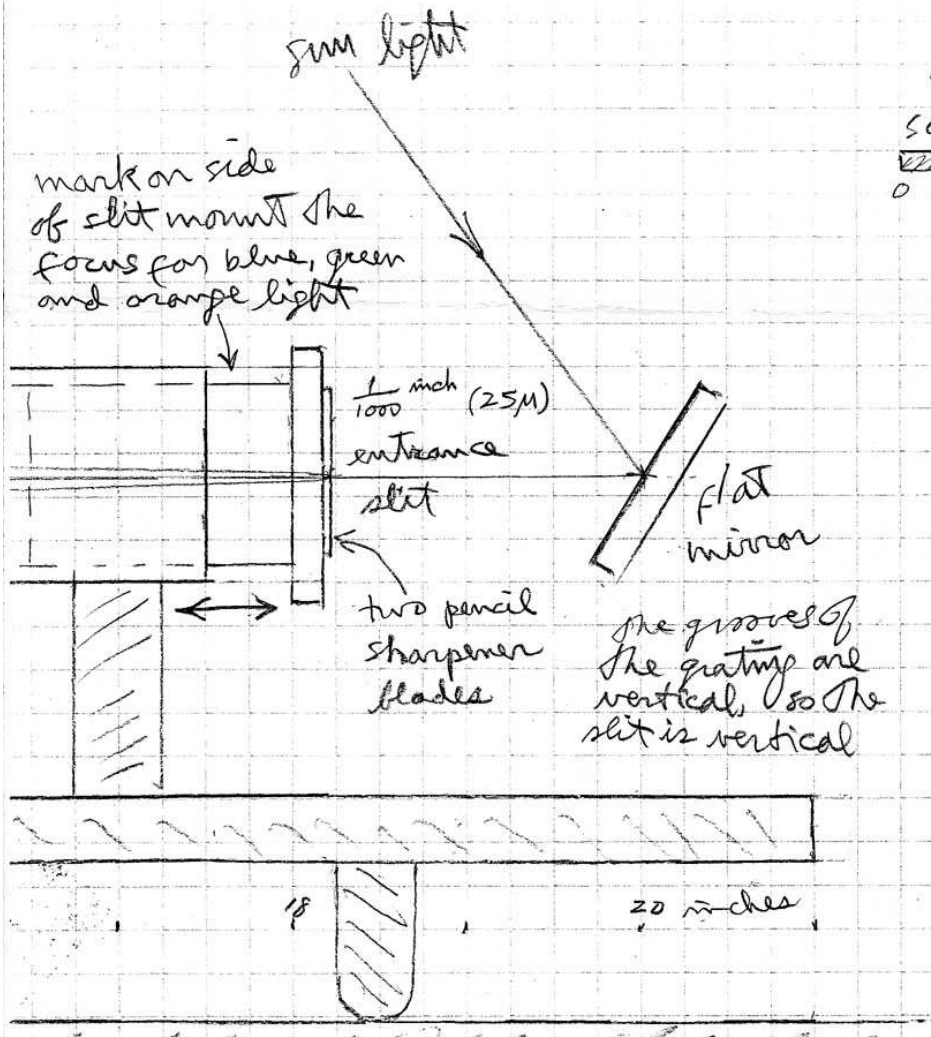
1. 3600Å λ, deep violet, eye not see
2. 3934Å λ, violet, H and K lines, can see
3. 4861Å λ, blue, H-beta
4. 5173Å λ, green, Mg lines
5. 5890Å λ, yellow, Na lines
6. 6563Å λ, orange-red, H-α line
7. 6800Å and 7600Å, O_2 atmos. lines of earth

Solar Spectroscope

Fredrick N. Veio, Calif.

July 2008





side view

spectroscope set up

1. mount collimator and telescope tubes so one can see grating in center of field; eyepiece and slit removed.
2. focus telescope with eyepiece at infinity
3. tilt grating for black narrow line, not Hα line.
4. focus slit mount, assume 25μ slit.
5. optics now in mutual focus. Observe spectrum.

← H'