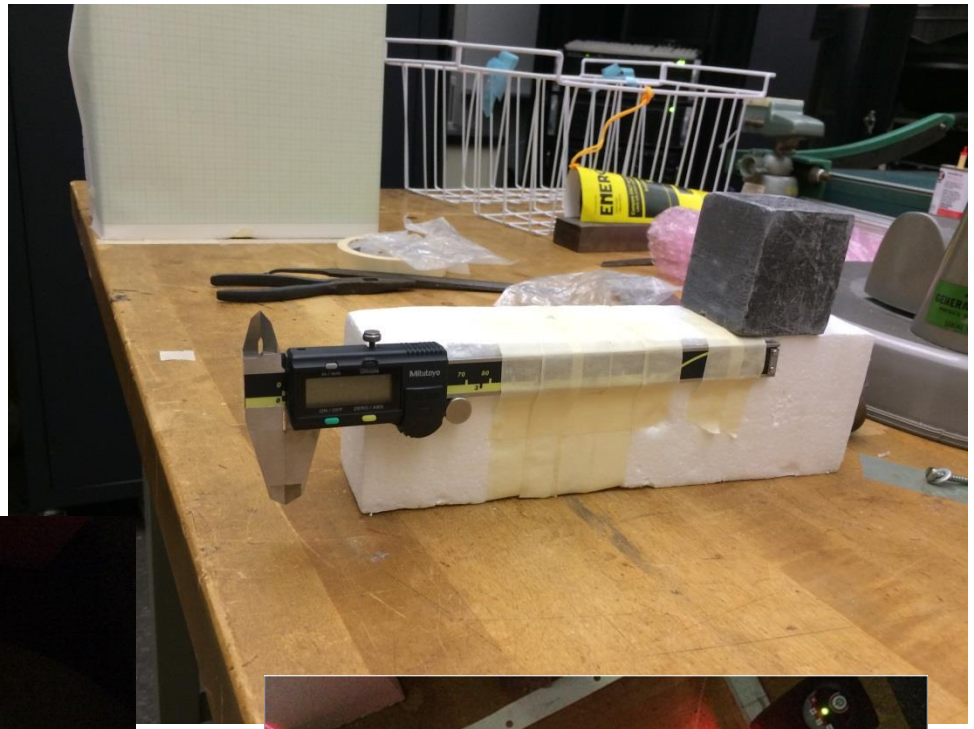
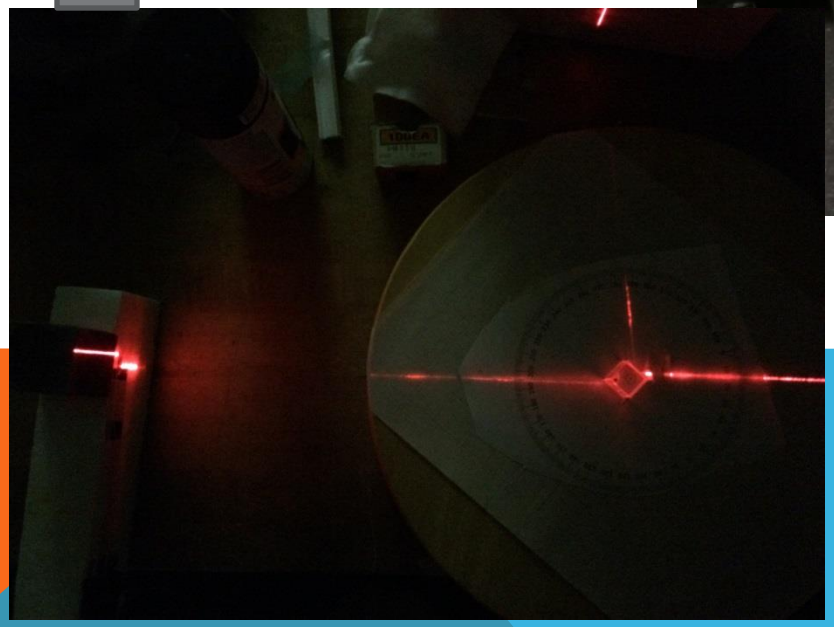
Characterization of $PbWO_4$

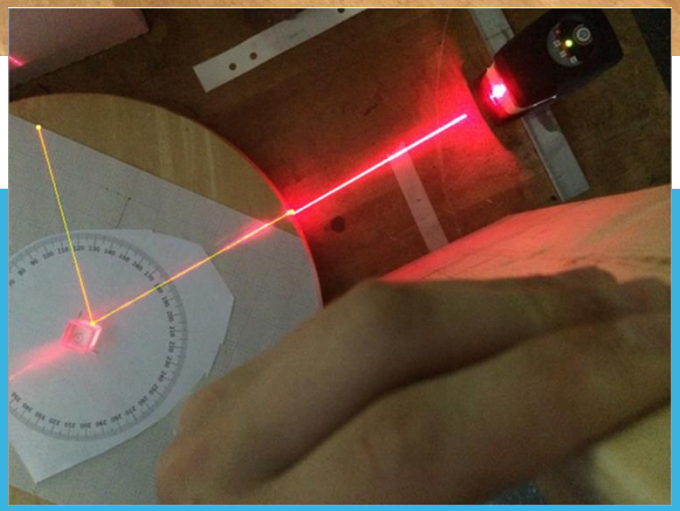
- Index of refraction
- Transmittance
- Absorption

THE MEASUREMENTS

CUA

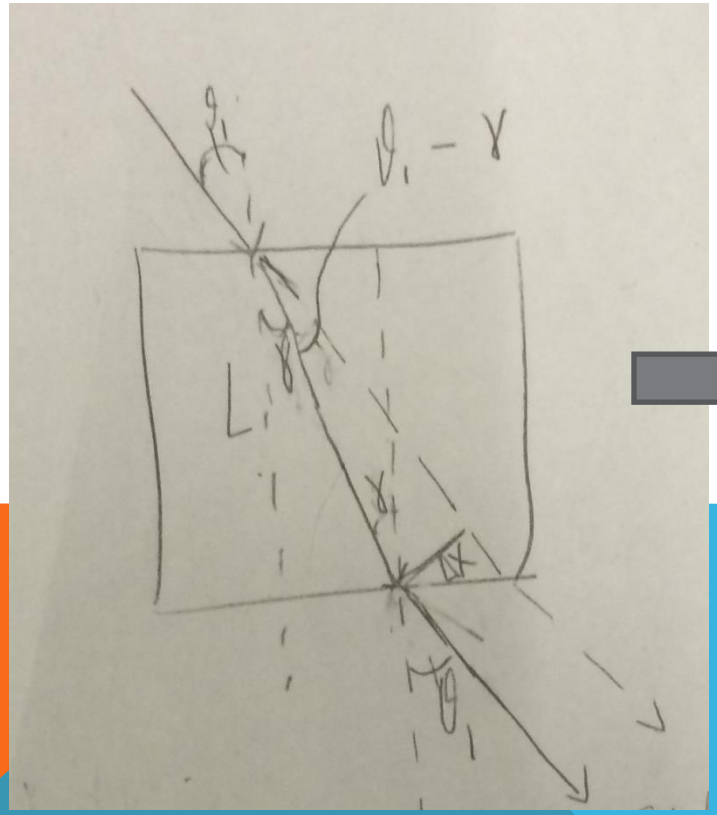


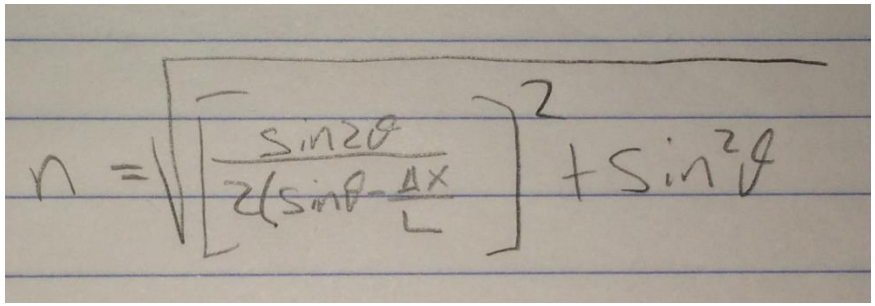




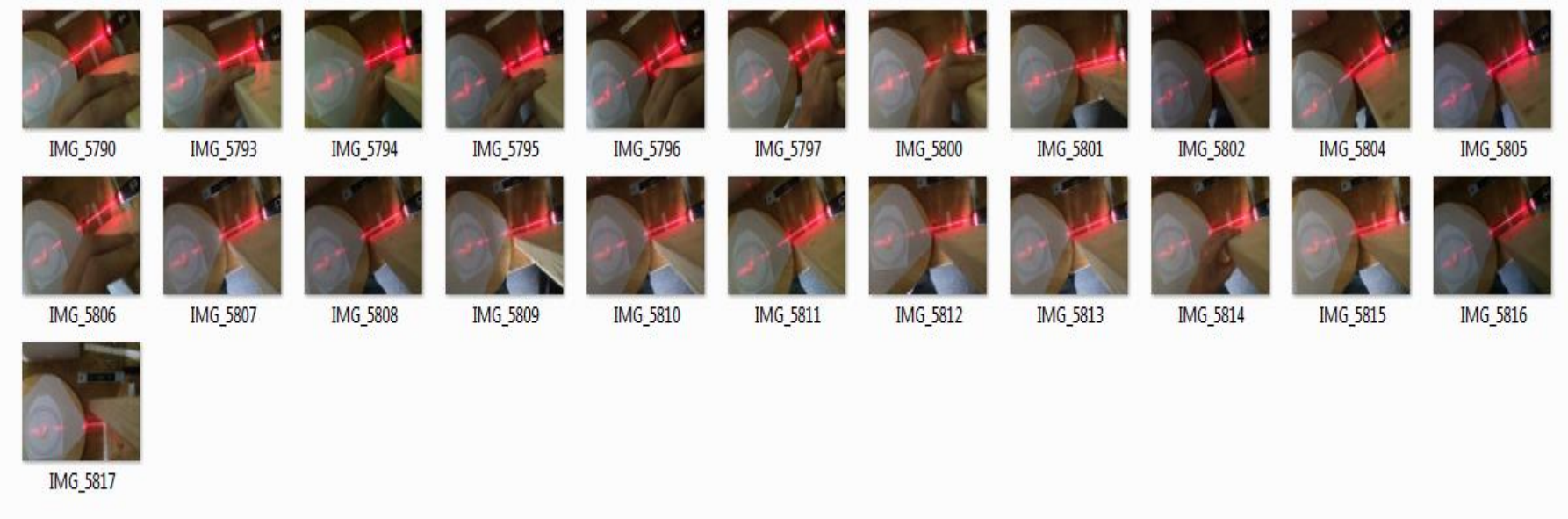
NEW EQUATION

The first equation I intended to use was only usable if the laser exited through the adjacent side. The light bends too much for the small edges of the cube and exits though the opposite side.

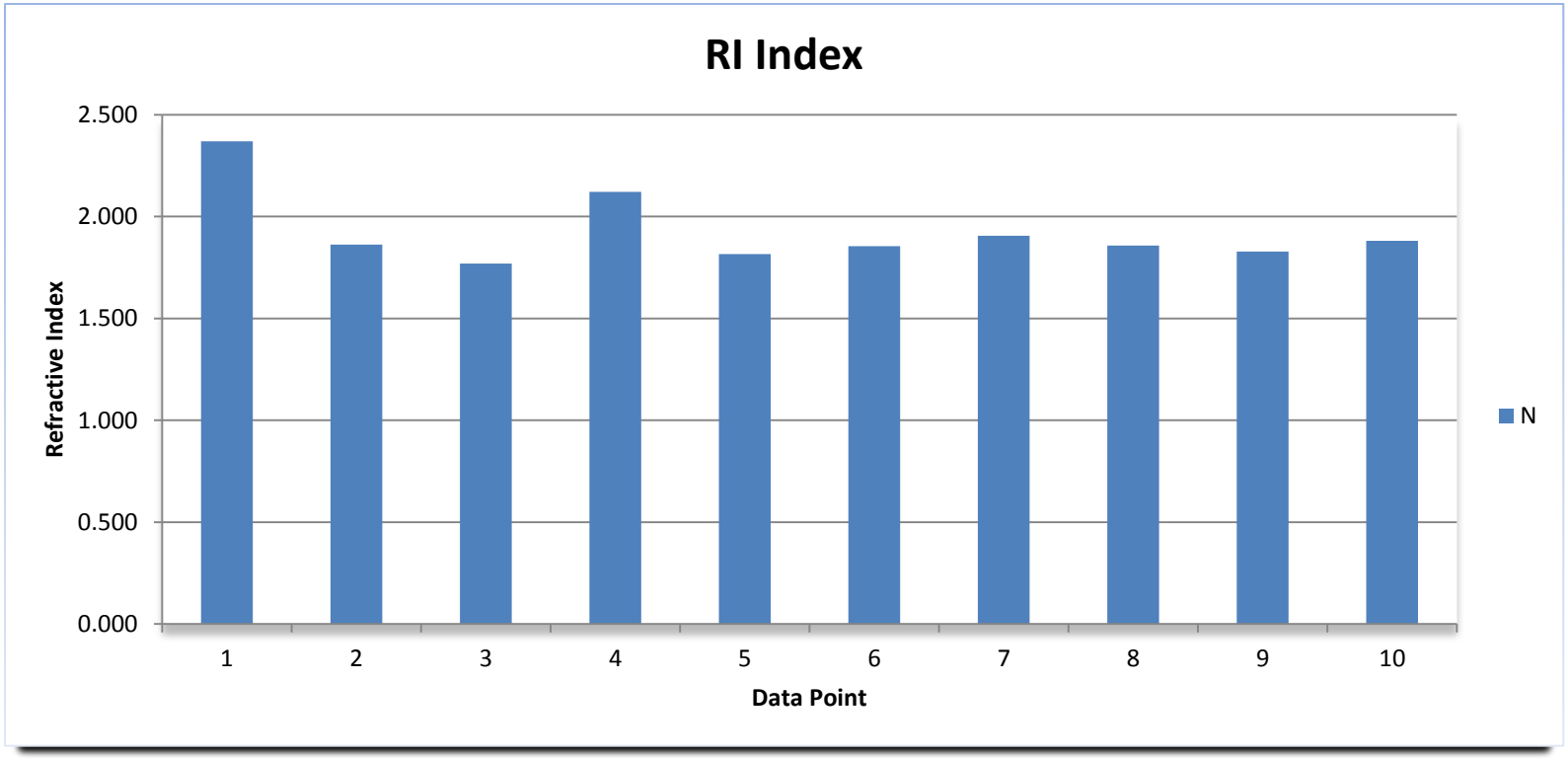




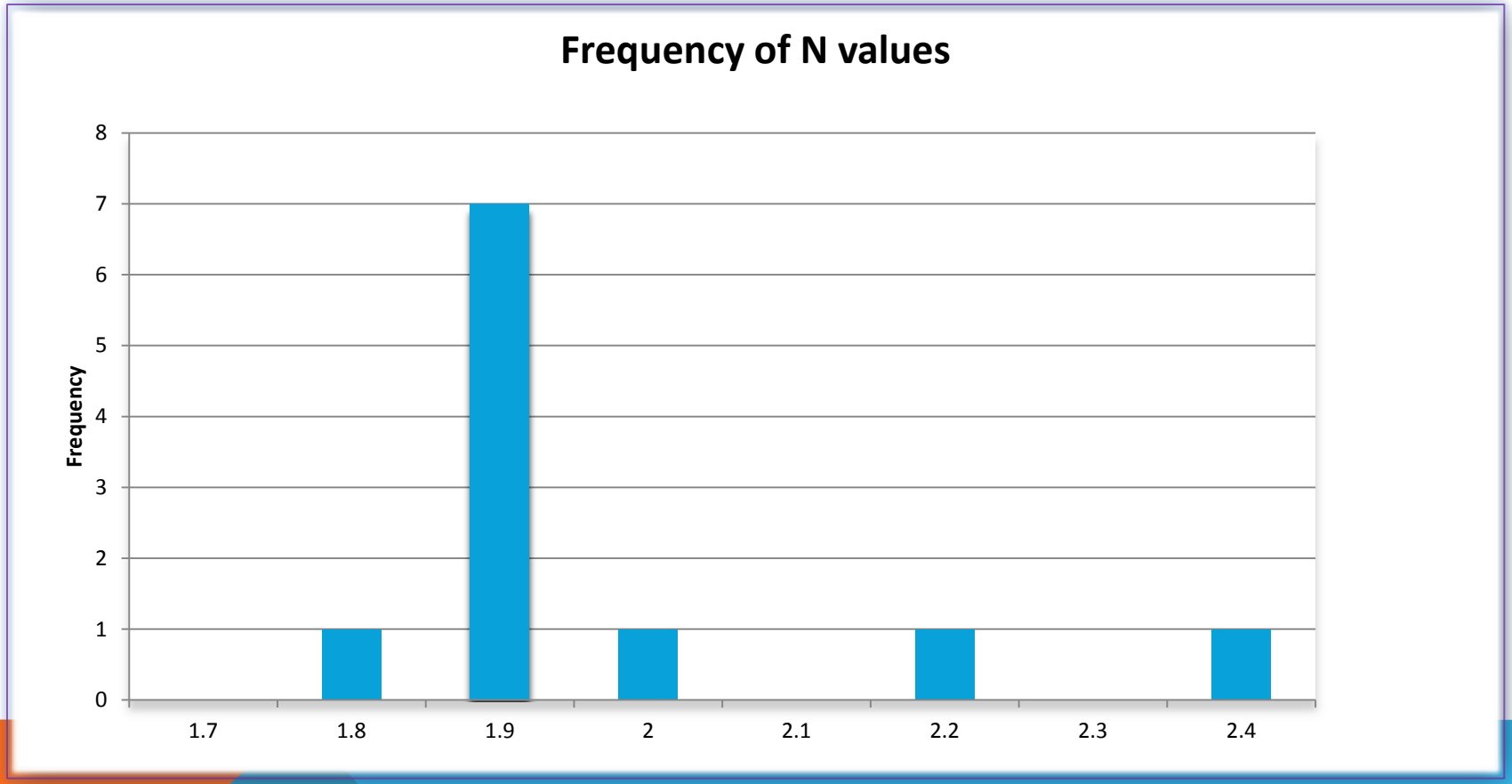
LOTS OF PICTURES!



REFRACTIVE INDEX OF $PBWO_4$

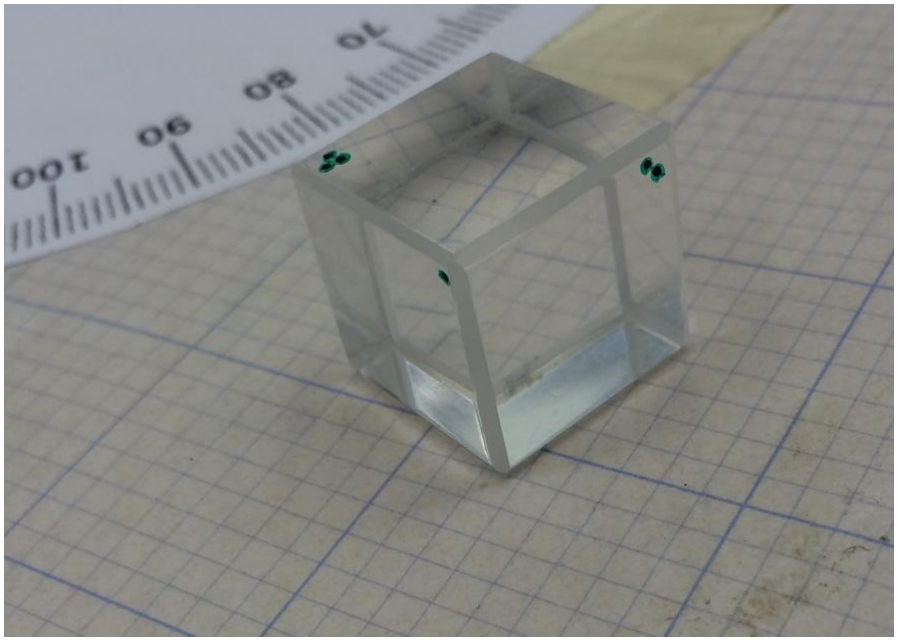


HISTOGRAM OF DATA POINTS



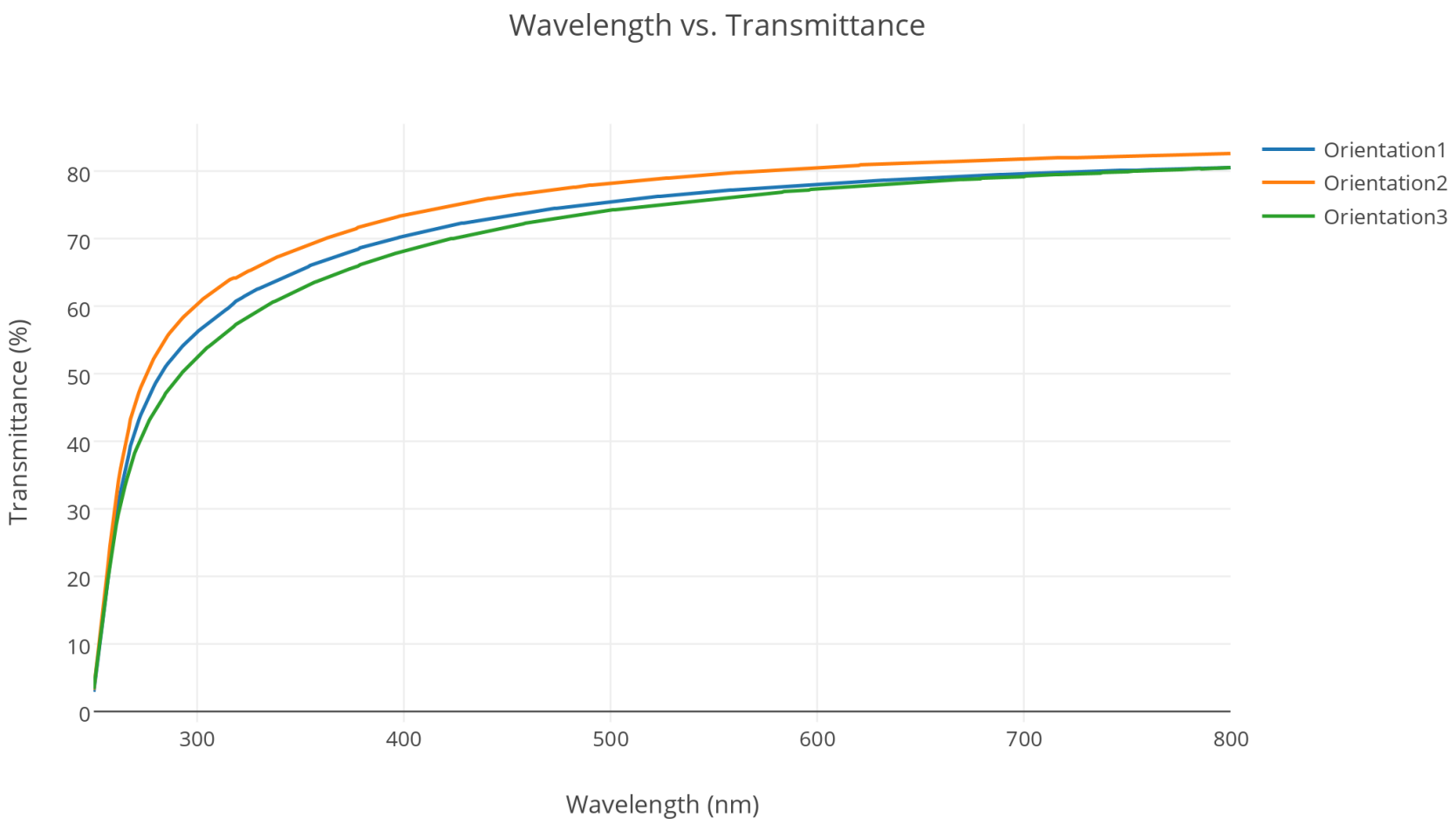
CALCULATING PERCENT TRANSMITTED

Each number of dots represents a different orientation:



A picture of a spectrometer found with Google Images!

WAVELENGTH VS. TRANSMITTANCE



COMPARING THE INDEX OF REFRACTION WITH TRANSMITTANCE

At the wavelength of the laser transmittance is (according to each orientation):

79.0%

78.4%

81.3%

$$R = \left(\frac{n_t - n_i}{n_t + n_i} \right)^2$$

82.43%

A MATLAB program I created which simplifies calculating the effects of compounded internal reflection using Fresnel's equations:

Editor - C:\Users\Runyon\Documents\MATLAB\Transmittence.m

Transmittence.m

```
%% calculates the % t based on refractive index

%% inputs
n1 = 1; % air
n2 = 1.9; % PbWO4
I0 = 1;
N = 10; % number of times to repeat

%% calculations
x = ((n2-n1)/(n2+n1))^2;
I1 = I0*(1-x);
I2 = I1*(1-x);
z = zeros(1,N);
a = I1;
for i = 1:N
I3 = a*x;
I4 = I3*x;
I5 = I4*(1-x);
z(i) = I5;
a = I4;
end
total = sum(z)+I2;
disp(total)
```