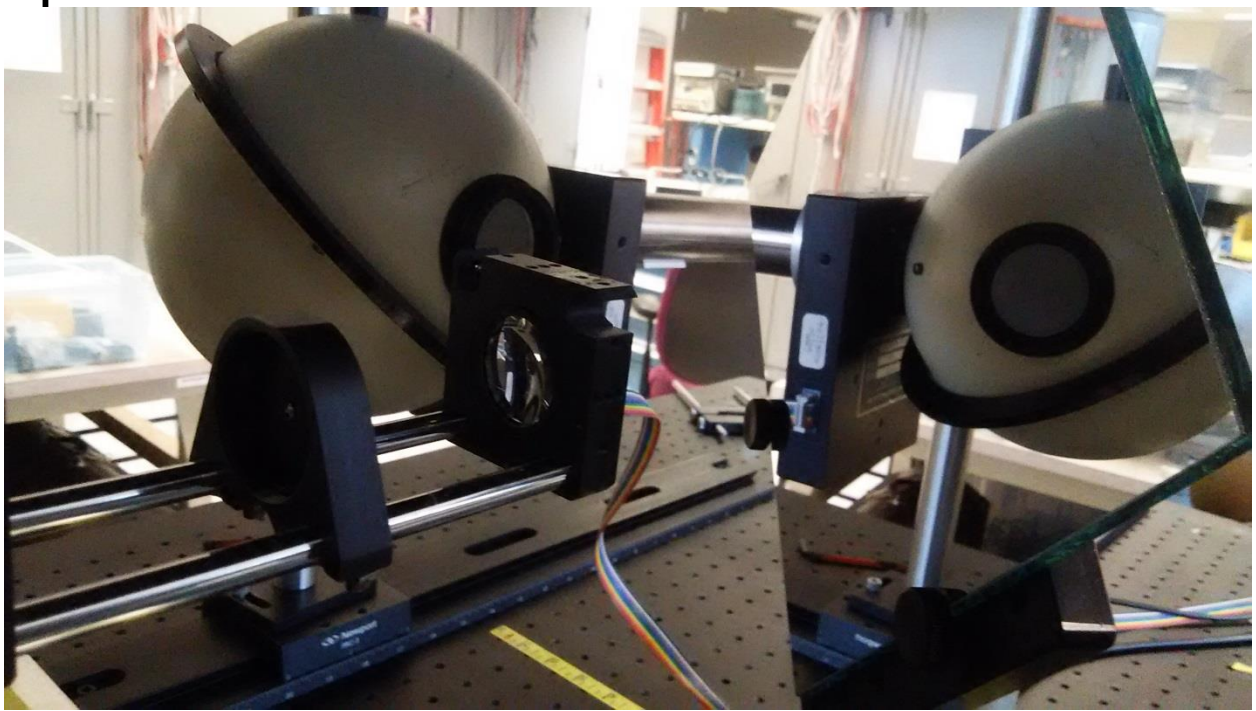
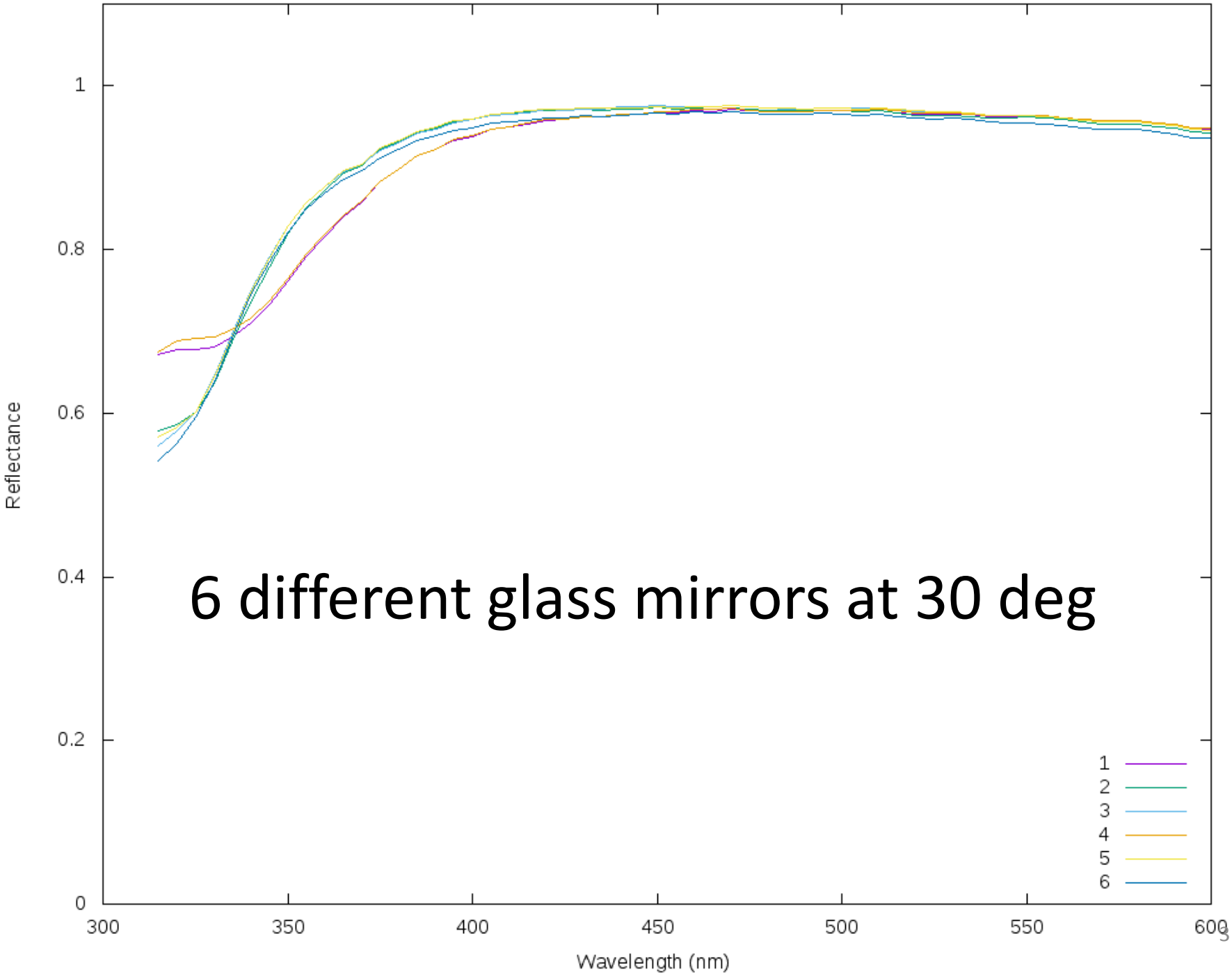
Mirror Reflectivity Results

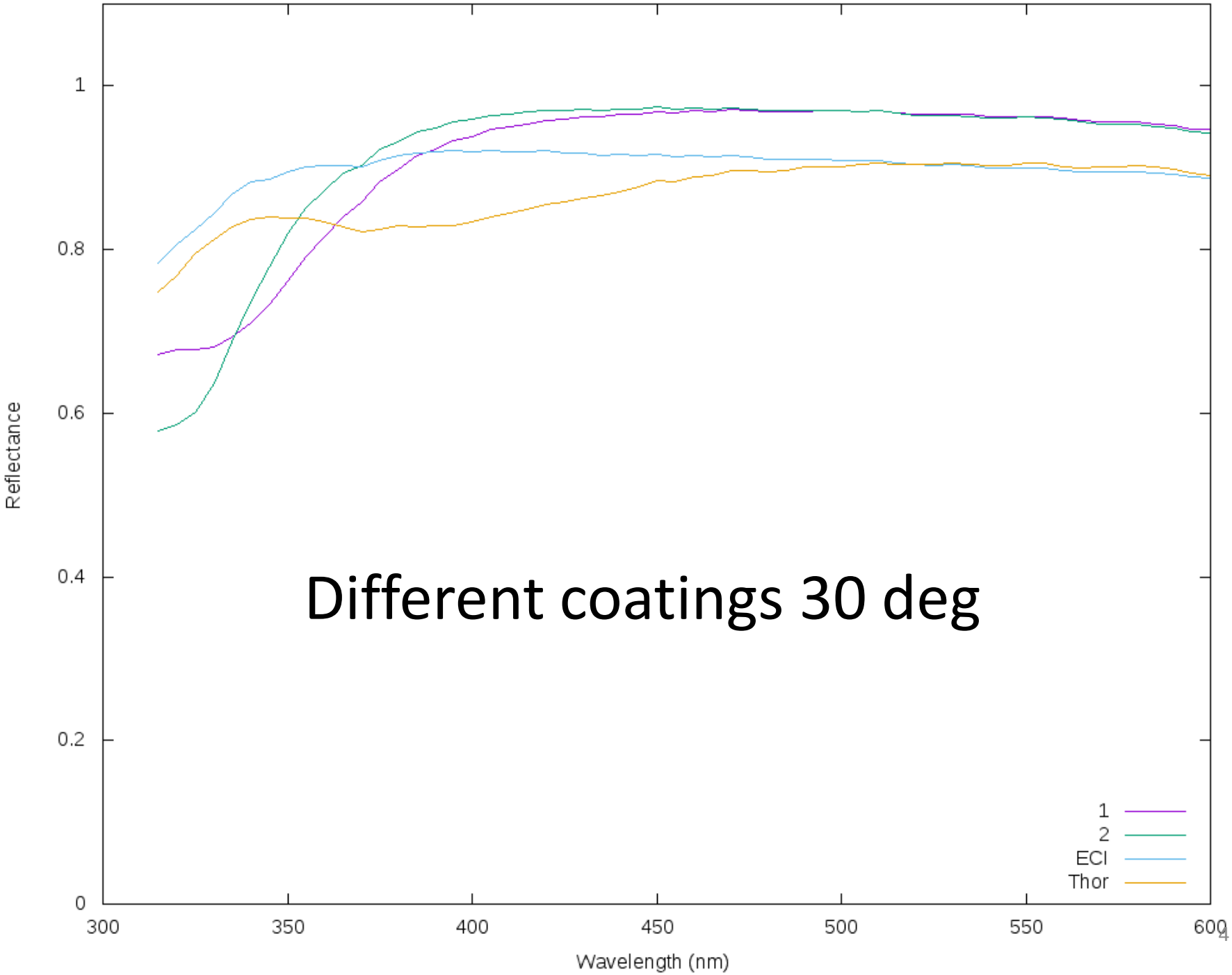
Process

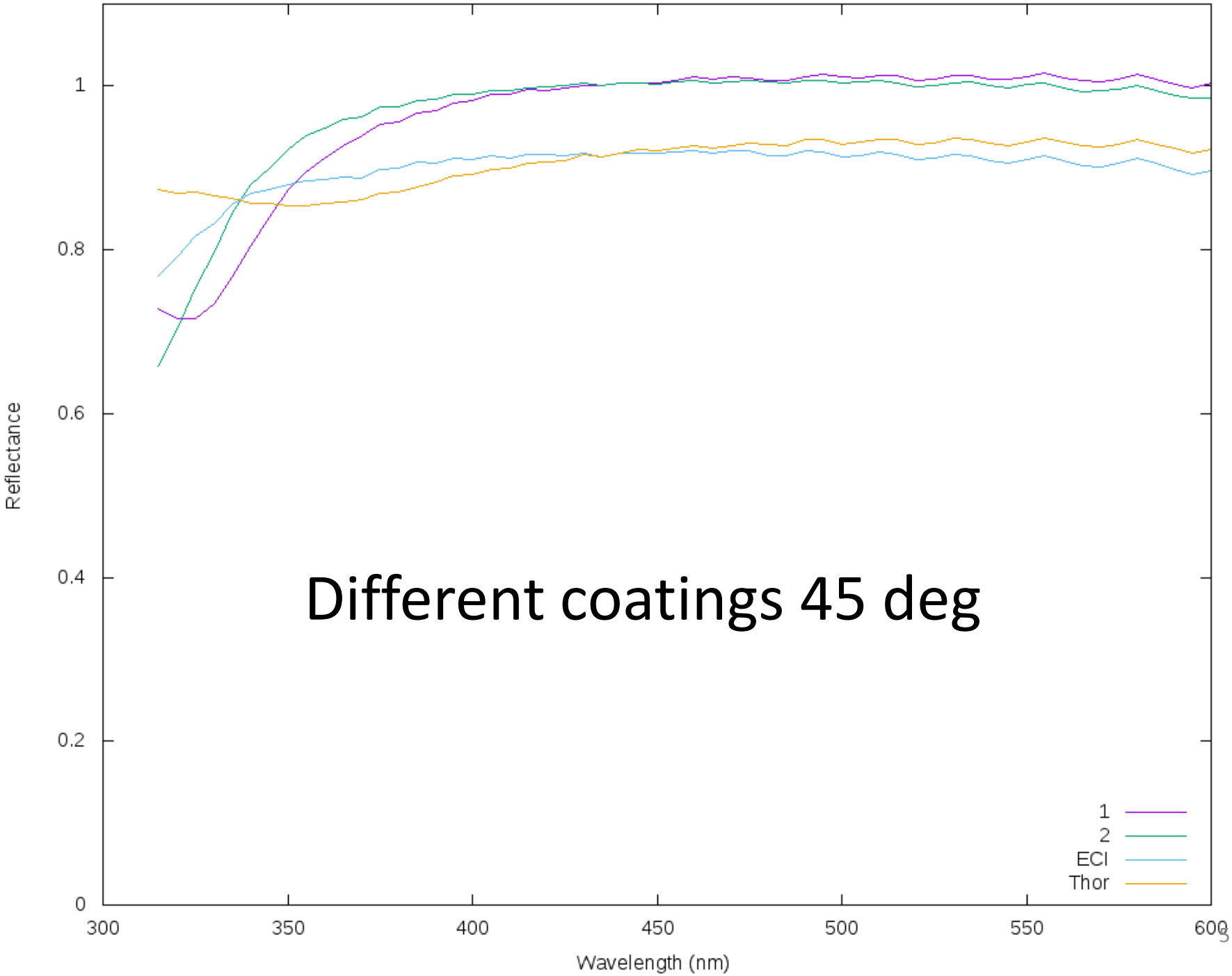
- Measure light directly into integrating sphere
  - Do this as a control for each angle
  - Day to day drift of the DAQ, coupling, etc
- Focus light on back of sphere at angles
- Compare DC current out of PMT

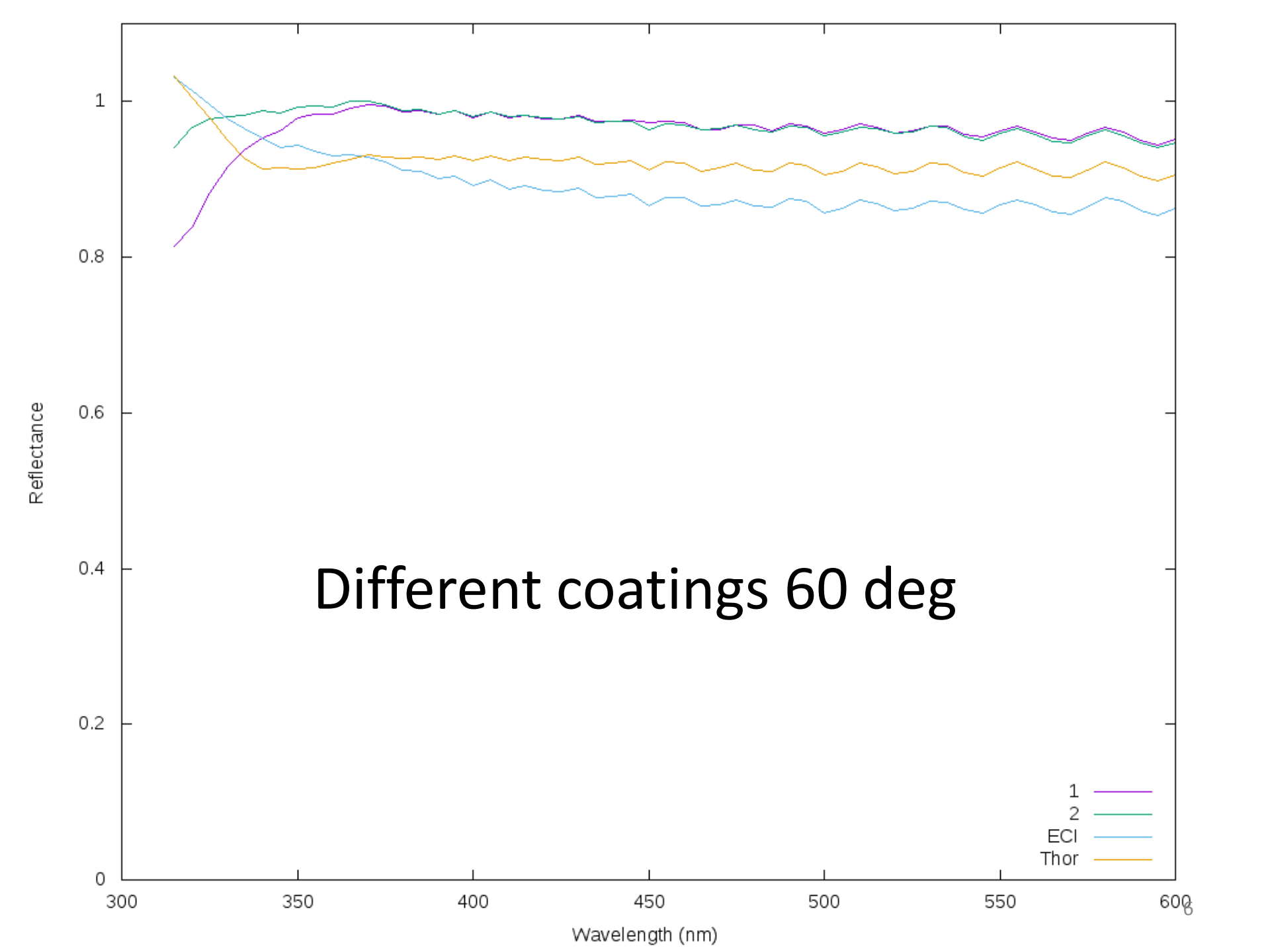


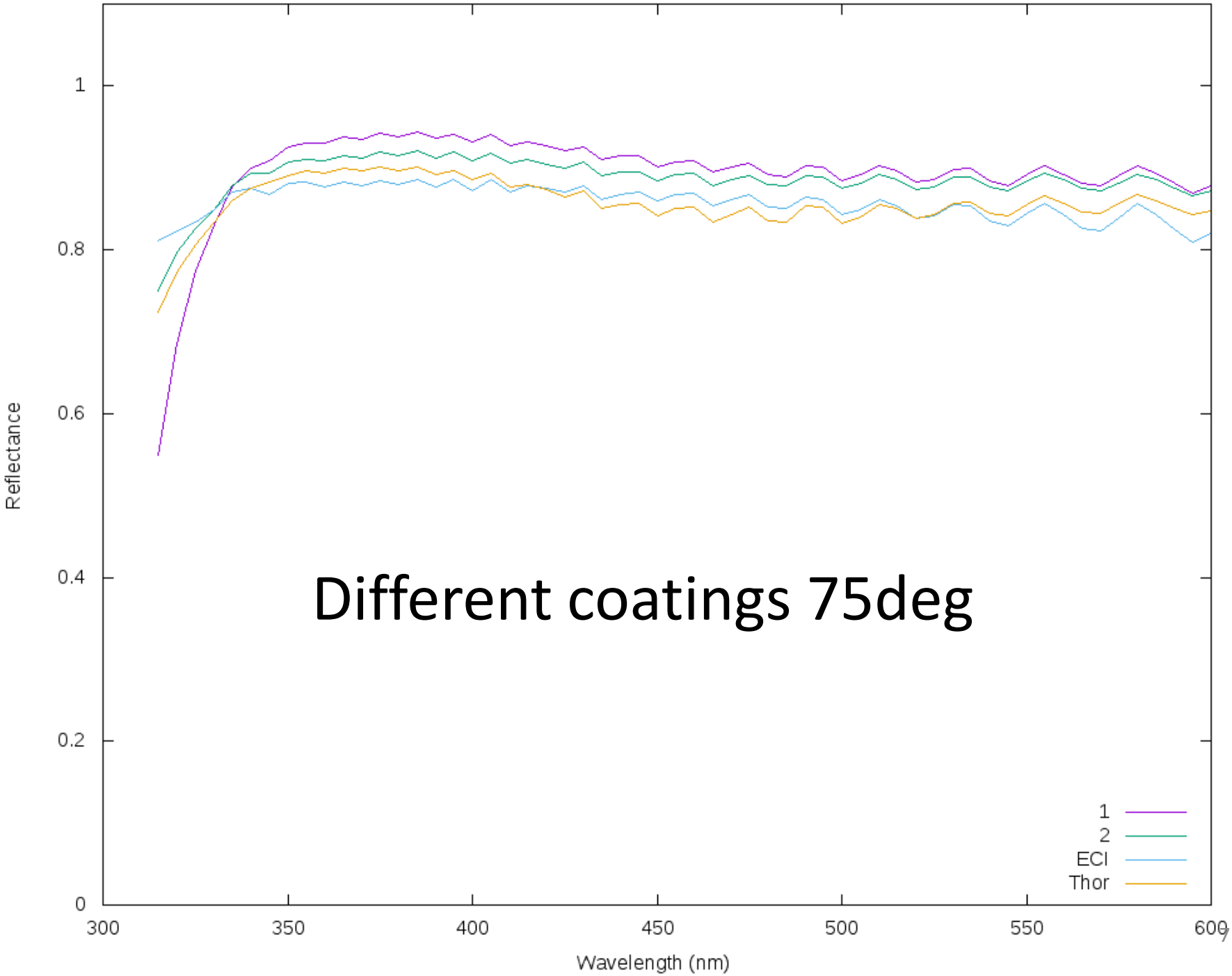


6 different glass mirrors at 30 deg


Different coatings 30 deg
Reflectance
Wavelength (nm)
0
0.2
0.4
0.6
0.8
1
300
350
400
450
500
550
600
1
2
ECI
Thor


Different coatings 45 deg
Reflectance
Wavelength (nm)
0
0.2
0.4
0.6
0.8
1
300
350
400
450
500
550
600
1
2
ECI
Thor

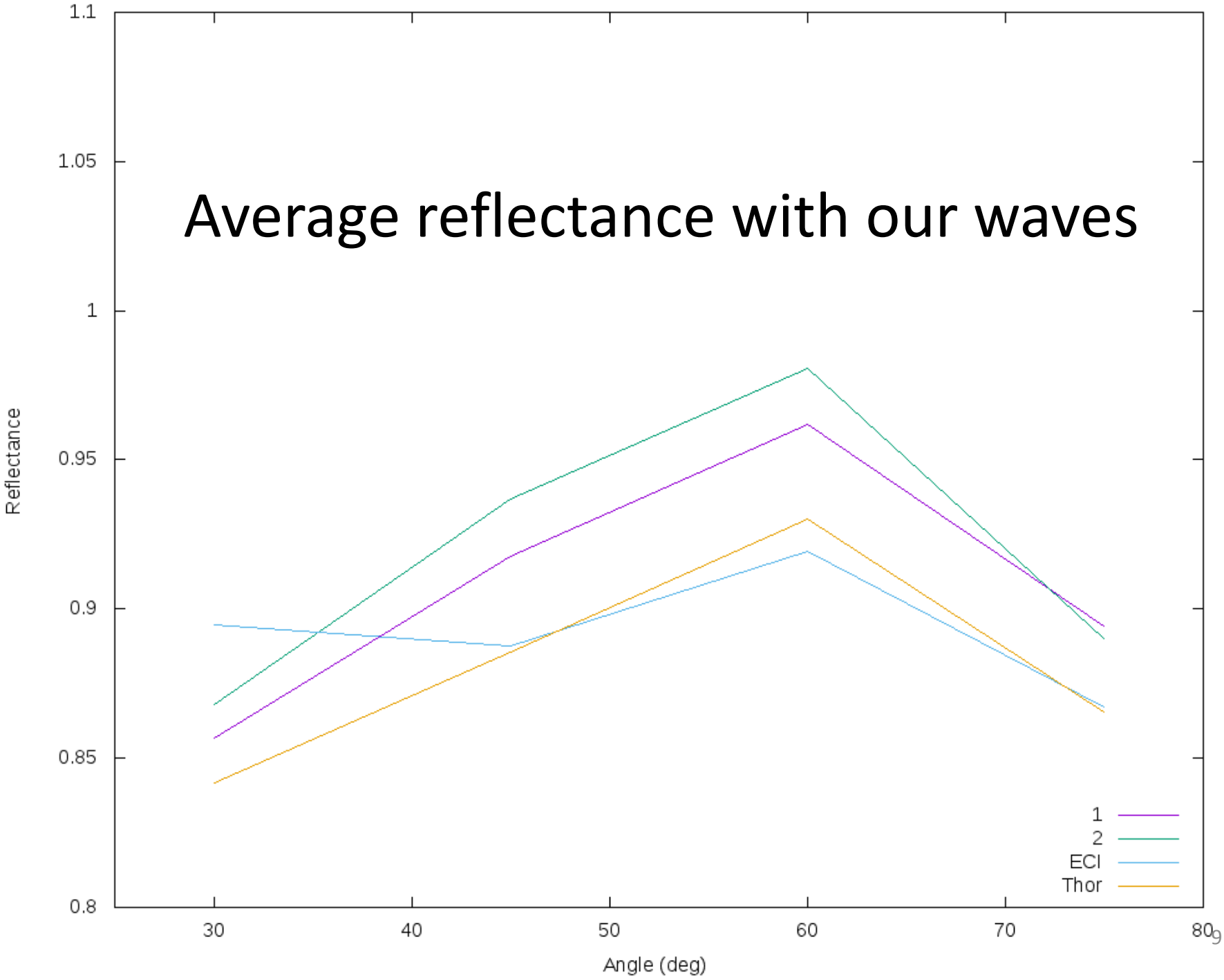

Different coatings 60 deg
Reflectance
Wavelength (nm)
0
0.2
0.4
0.6
0.8
1
300
350
400
450
500
550
600
1
2
ECI
Thor

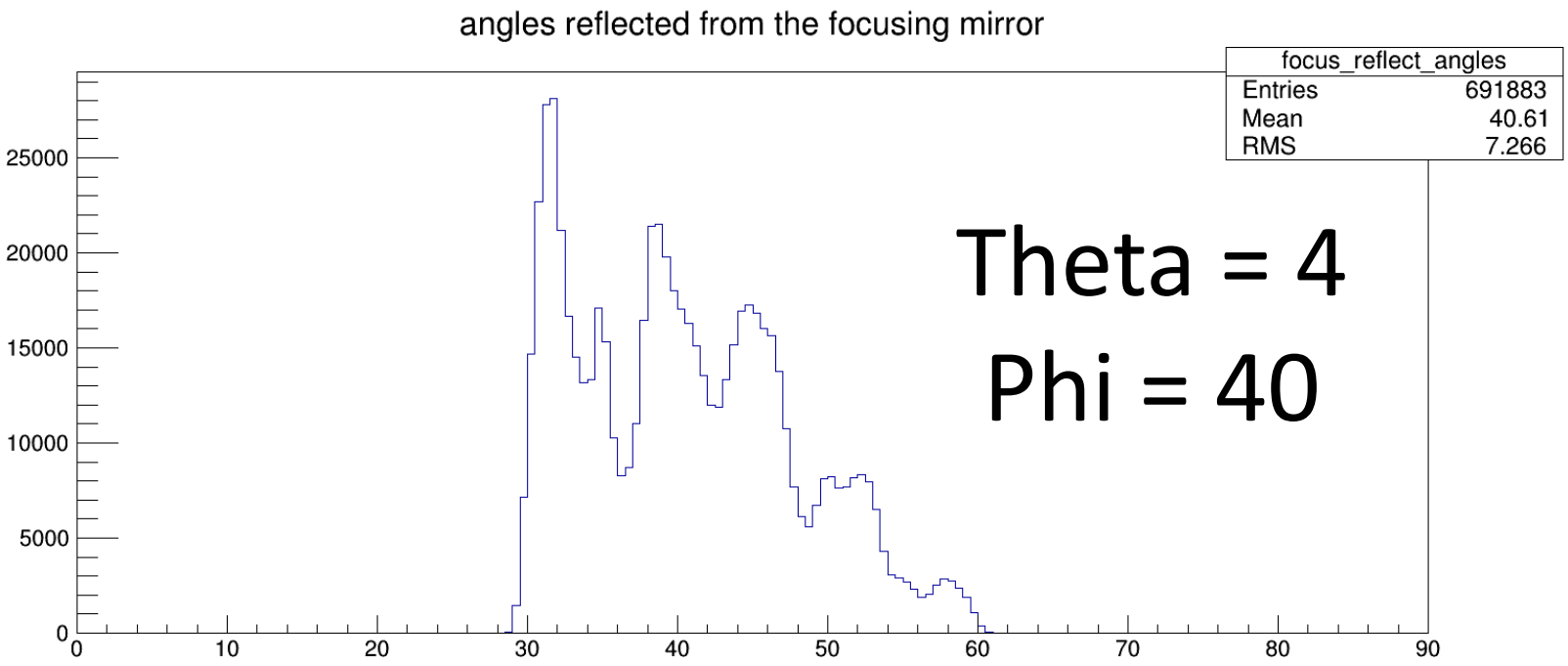

Different coatings 75deg
Reflectance
Wavelength (nm)
0
0.2
0.4
0.6
0.8
1
300
350
400
450
500
550
600
1
2
ECI
Thor

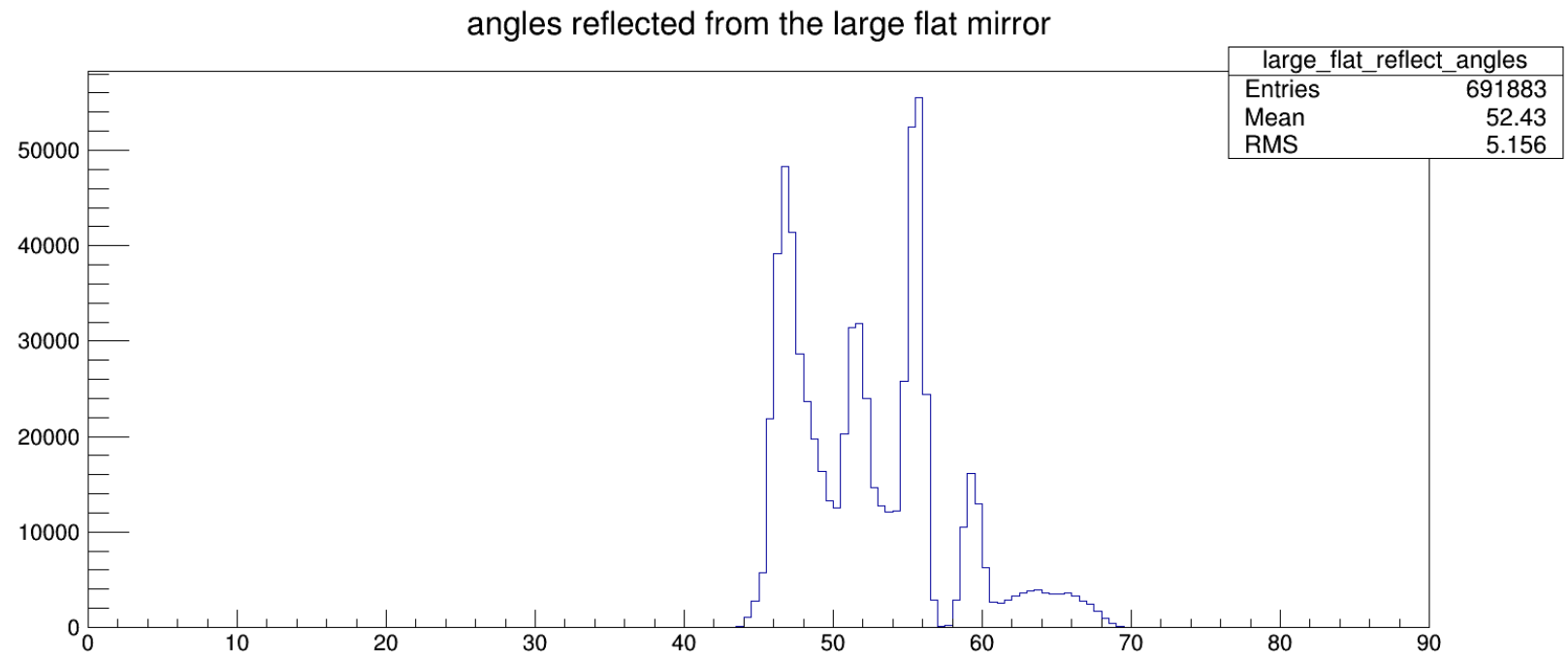
Problems

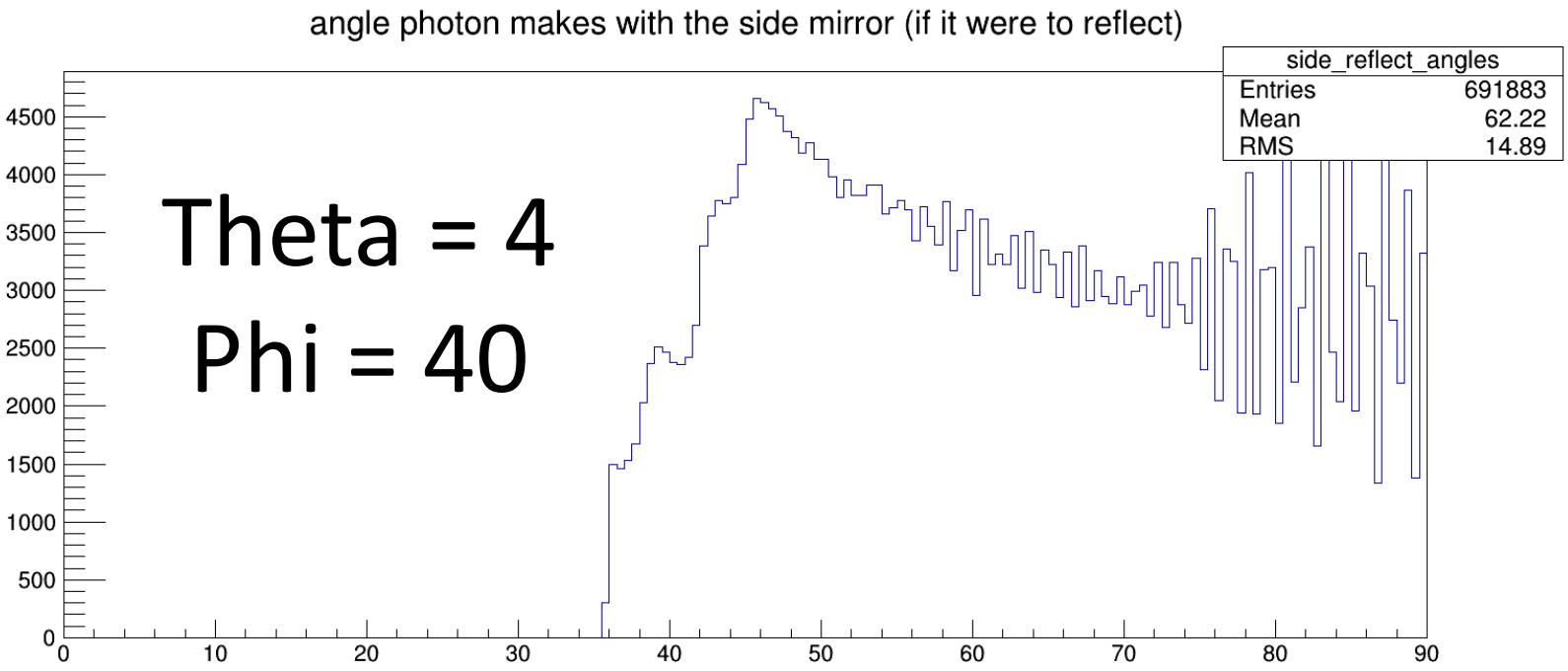
- Wiggles at high wavelengths for shallow reflections
- Over unity reflectance at 60 deg
- I suspect both of these are related to overtones from the monochromator that show up at strange angles, am still investigating this

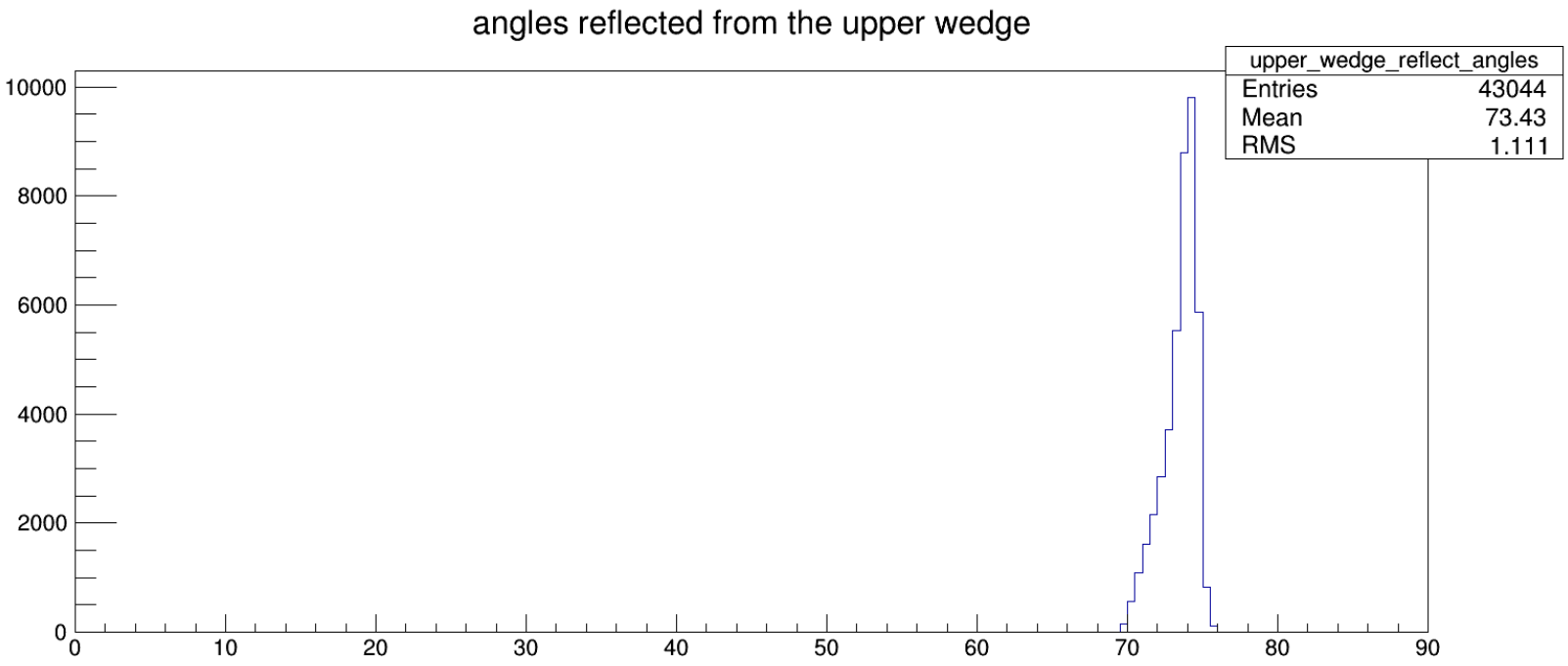
Average reflectance with our waves

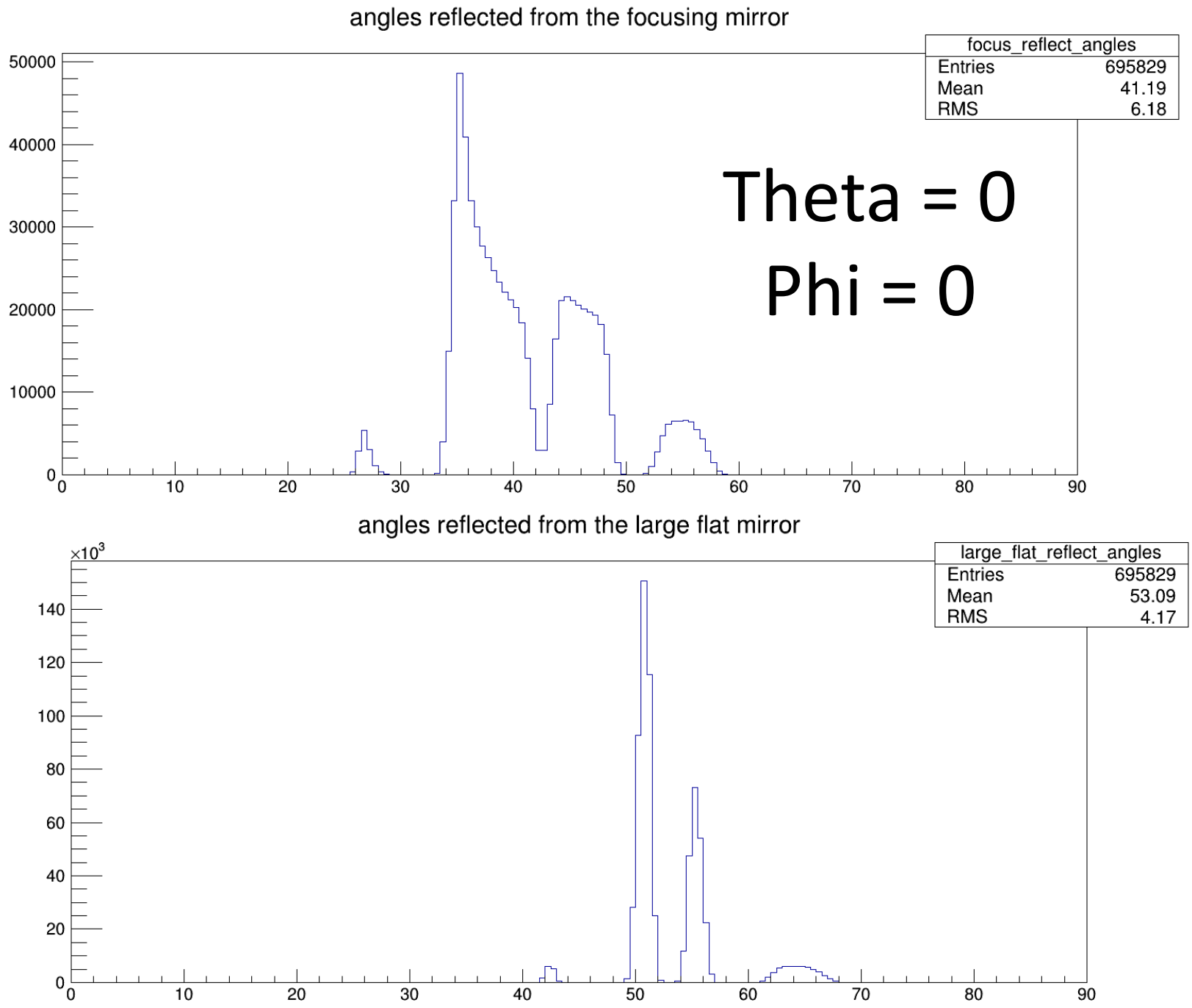


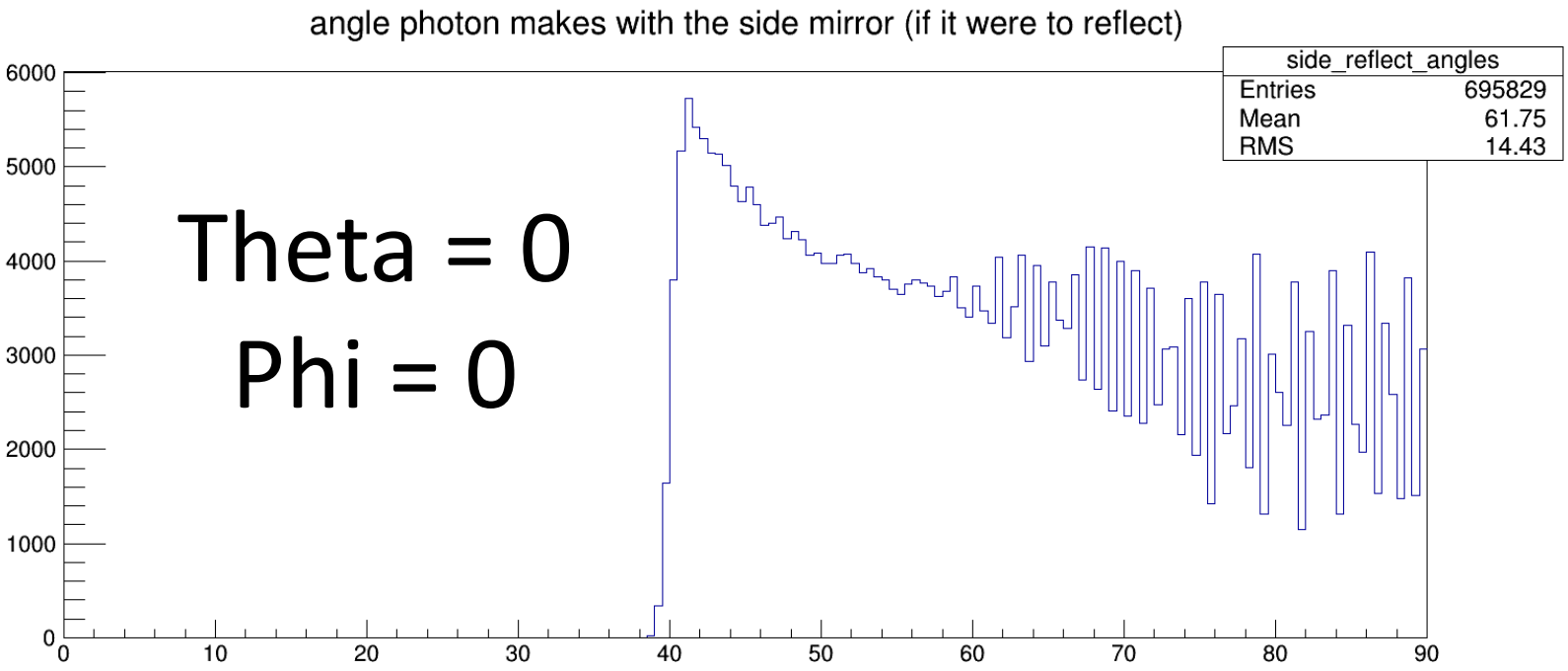

angles reflected from the focusing mirror
focus_reflect_angles
Entries 691883
Mean 40.61
RMS 7.266
Theta = 4
Phi = 40
0
5000
10000
15000
20000
25000
0
10
20
30
40
50
60
70
80
90

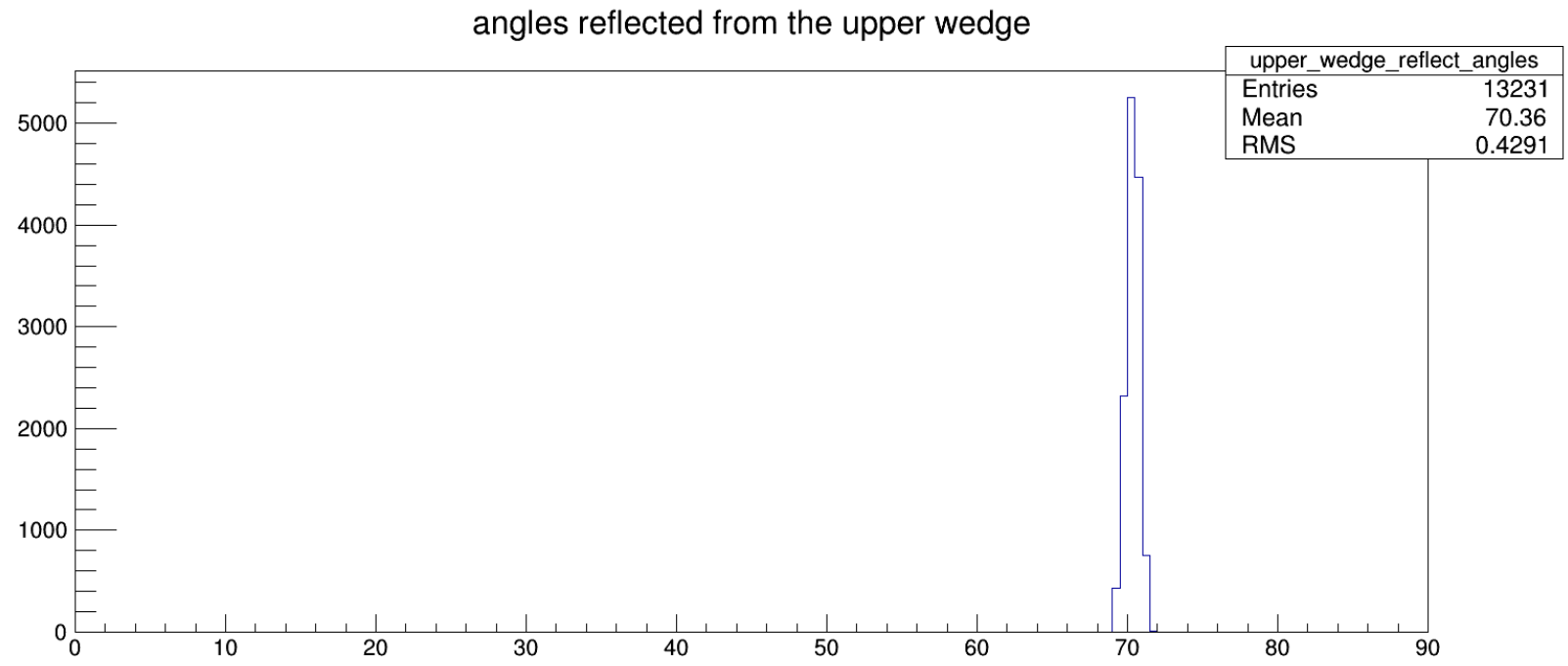

angles reflected from the large flat mirror
large_flat_reflect_angles
Entries 691883
Mean 52.43
RMS 5.156
0
10000
20000
30000
40000
50000
0
10
20
30
40
50
60
70
80
90

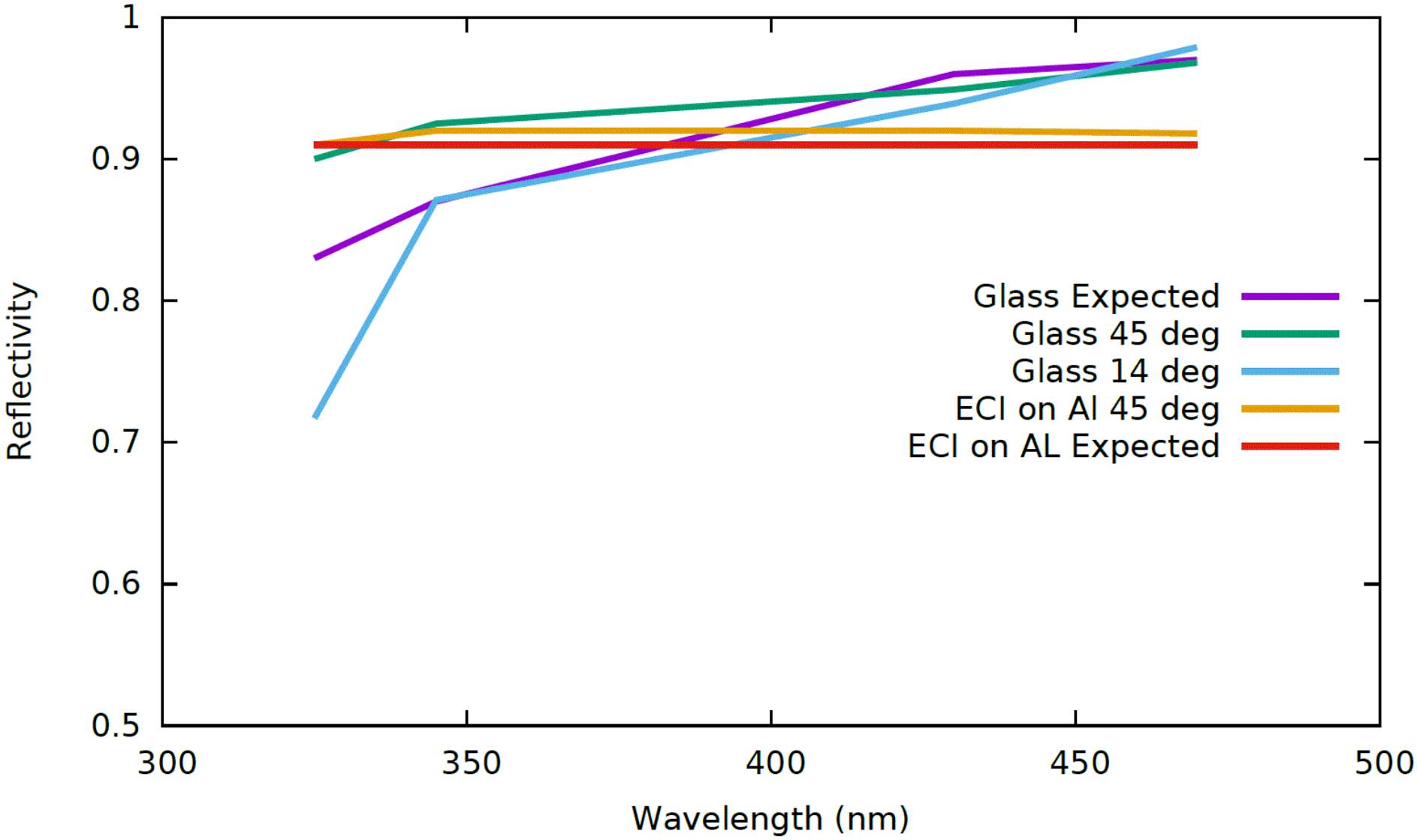

angle photon makes with the side mirror (if it were to reflect)
side_reflect_angles
Entries 691883
Mean 62.22
RMS 14.89
Theta = 4
Phi = 40
0 500 1000 1500 2000 2500 3000 3500 4000 4500
0 10 20 30 40 50 60 70 80 90

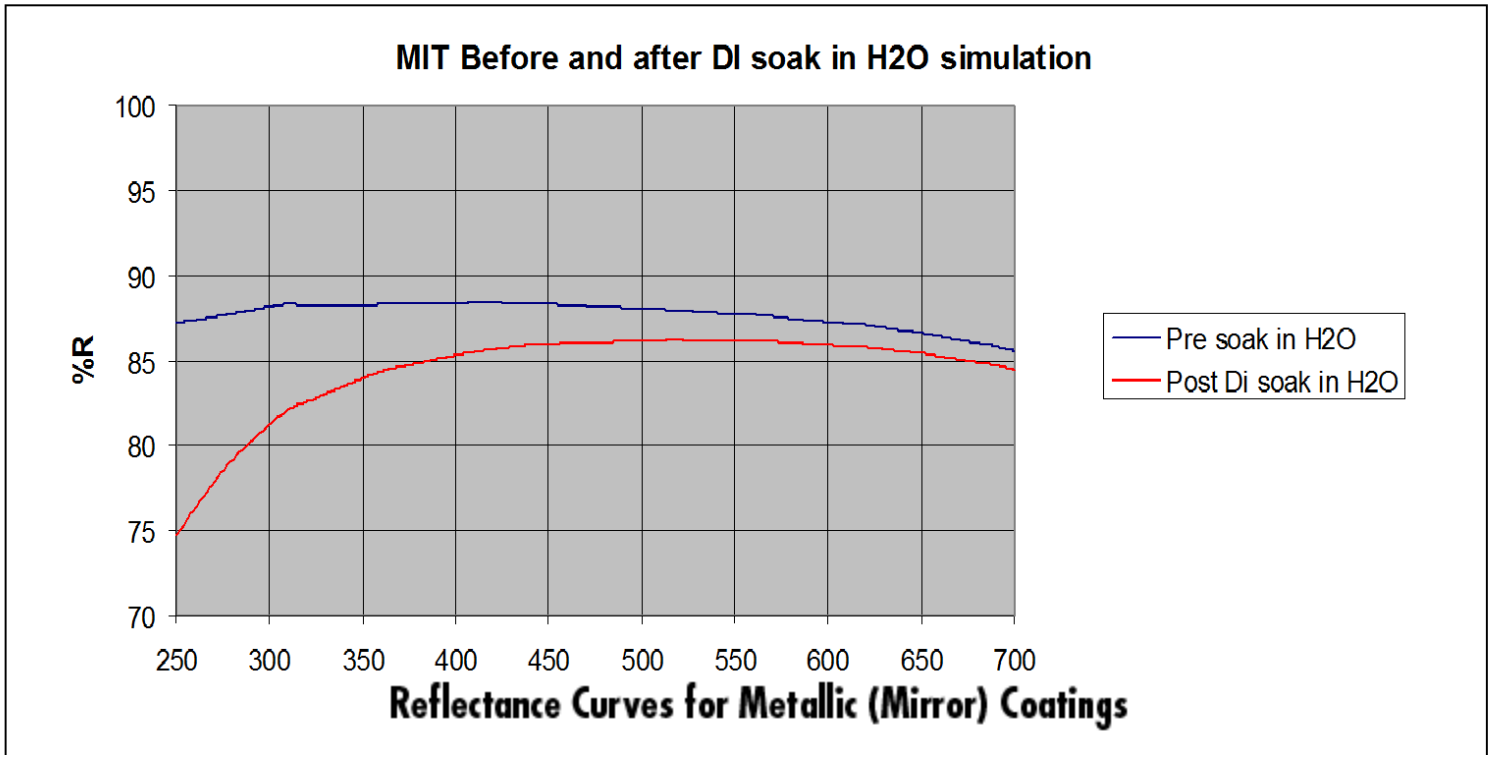

angles reflected from the upper wedge
upper_wedge_reflect_angles
Entries 43044
Mean 73.43
RMS 1.111
0 2000 4000 6000 8000 10000
0 10 20 30 40 50 60 70 80 90

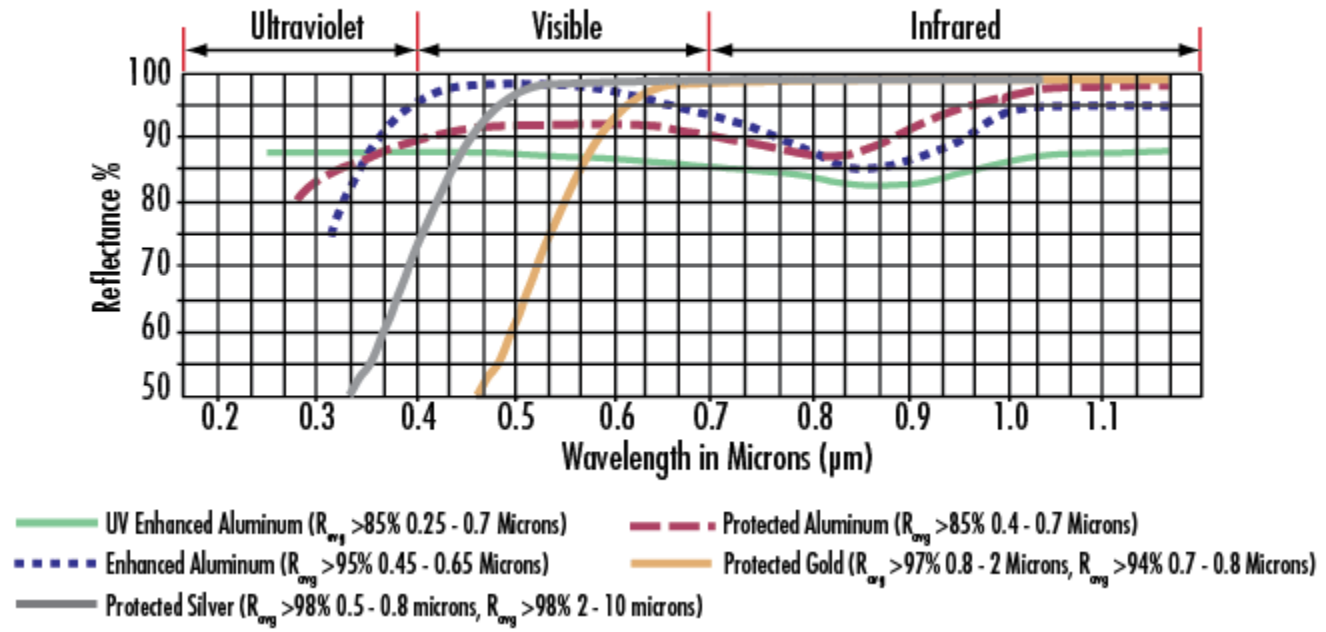

angles reflected from the focusing mirror
focus_reflect_angles
Entries 695829
Mean 41.19
RMS 6.18
Theta = 0
Phi = 0
angles reflected from the large flat mirror
large_flat_reflect_angles
Entries 695829
Mean 53.09
RMS 4.17
×10^3

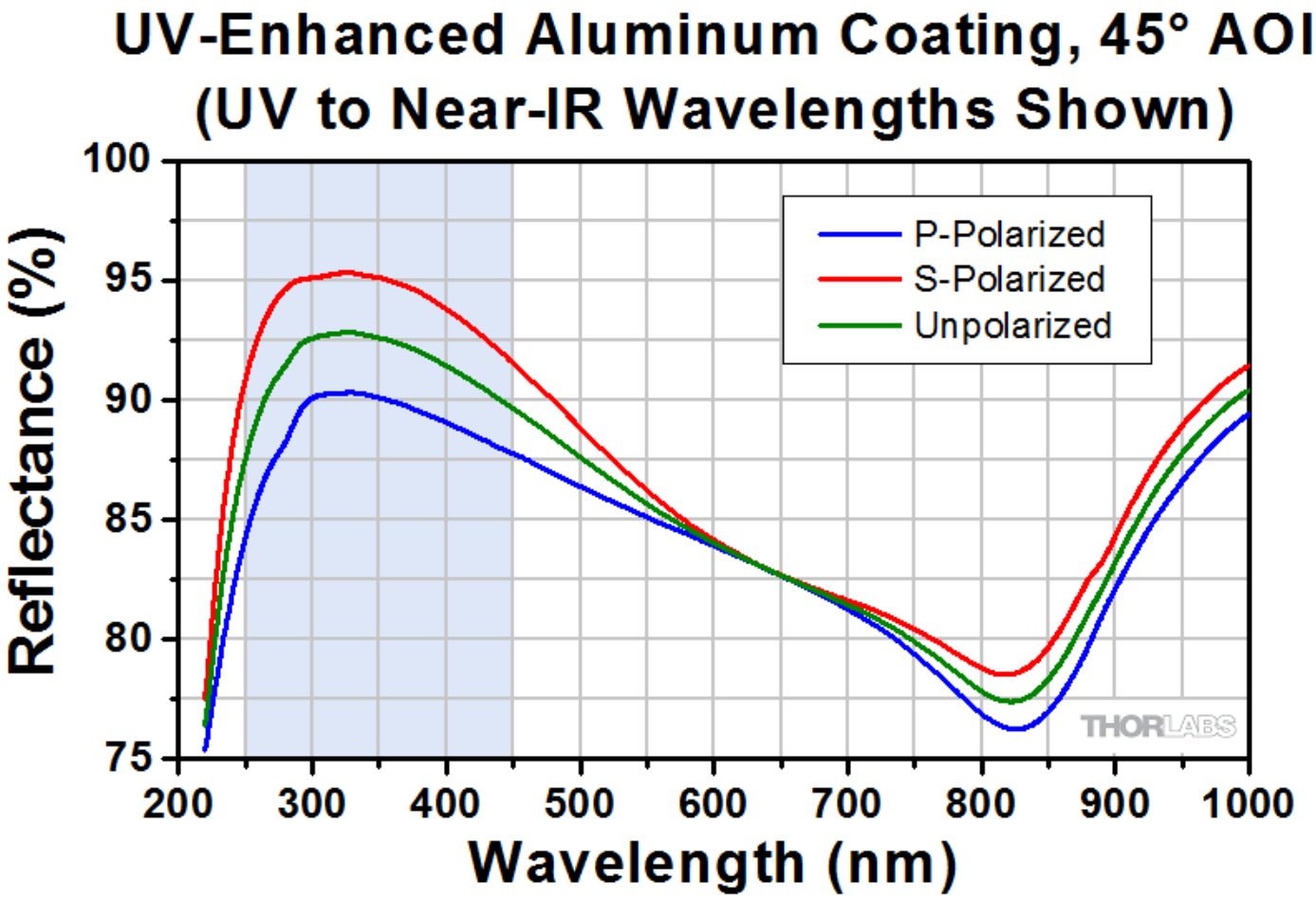

angle photon makes with the side mirror (if it were to reflect)
side_reflect_angles
Entries 695829
Mean 61.75
RMS 14.43
Theta = 0
Phi = 0
6000
5000
4000
3000
2000
1000
0
0
10
20
30
40
50
60
70
80
90


angles reflected from the upper wedge
upper_wedge_reflect_angles
Entries 13231
Mean 70.36
RMS 0.4291
5000
4000
3000
2000
1000
0
0
10
20
30
40
50
60
70
80
90


1
0.9
0.8
0.7
0.6
0.5
Reflectivity
300
350
400
450
500
Wavelength (nm)
Glass Expected
Glass 45 deg
Glass 14 deg
ECI on Al 45 deg
ECI on AL Expected


MIT Before and after DI soak in H2O simulation
%R
100
95
90
85
80
75
70
250
300
350
400
450
500
550
600
650
700
Pre soak in H2O
Post Di soak in H2O


Reflectance Curves for Metallic (Mirror) Coatings
Ultraviolet
Visible
Infrared
Reflectance %
100
90
80
70
60
50
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
Wavelength in Microns (µm)
UV Enhanced Aluminum (R avg >85% 0.25 - 0.7 Microns)
Protected Aluminum (R avg >85% 0.4 - 0.7 Microns)
Enhanced Aluminum (R avg >95% 0.45 - 0.65 Microns)
Protected Gold (R avg >97% 0.8 - 2 Microns, R avg >94% 0.7 - 0.8 Microns)
Protected Silver (R avg >98% 0.5 - 0.8 microns, R avg >98% 2 - 10 microns)


UV-Enhanced Aluminum Coating, 45° AOI
(UV to Near-IR Wavelengths Shown)
Reflectance (%)
100
95
90
85
80
75
200
300
400
500
600
700
800
900
1000
Wavelength (nm)
P-Polarized
S-Polarized
Unpolarized
THORLABS