Progress in lead glass cleaning with UV

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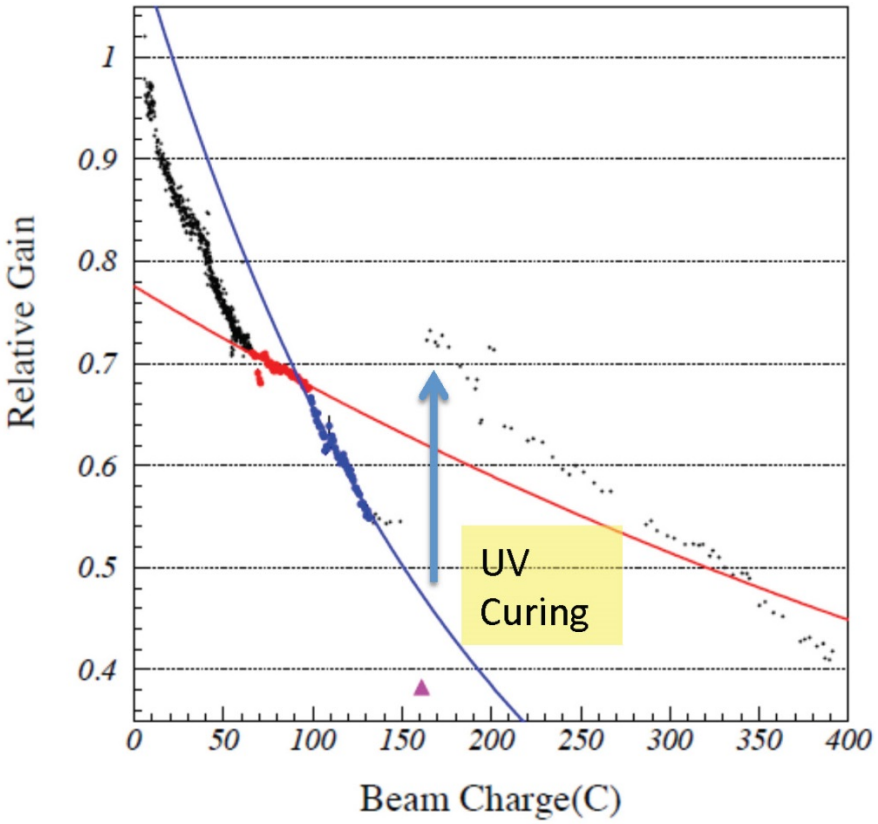
GOAL (reminder)

We need to prove that periodic UV irradiation of more than 1744 lead glass bars is a viable option to maintain a given level of transparency during the 150x8h shifts of GEp(5)

UV Curing



Hall C Experience:

- UV cured the BigCal for 3 days on each ¼ of the detector.
- Improved the gain from 39% to 74%
- Rate of improvement is 1.24%/hr

GEp5:

- Need to be cured 6% /hr
- Will increase UV intensity by x5
- UV cure for 1hr after 7 hours of running. (Need to have HV off)

New UV lamps (reminder)

GEp(3) used OSRAM DULUX L 24W/67

(…) compact fluorescent lamps DL 24W/67 have a total UVA-power (315…400nm) less than 50 mW. The total output between 400…550nm is about 5.5W.

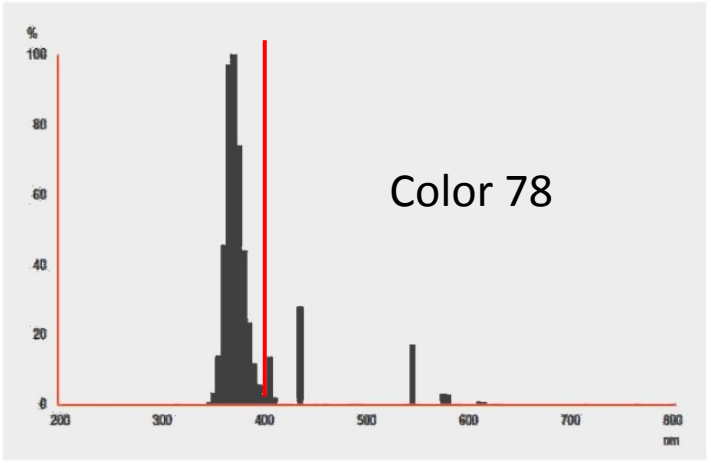
DULUX L 18W/**78**

Power = 18W

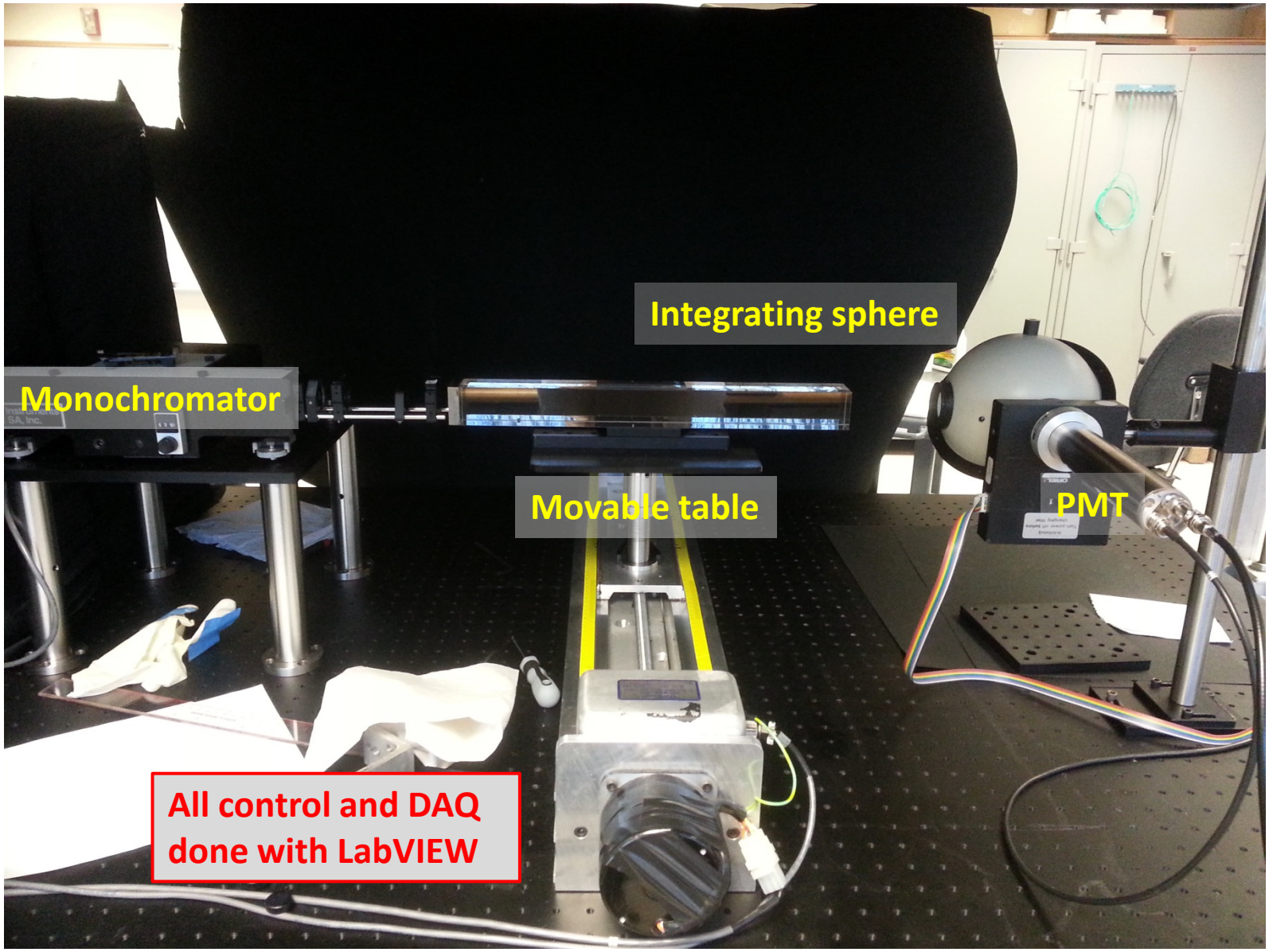
UVA (315-400 nm) = 3 W

Length = 225 mm (without ballast)

Radiation Intensity = 1.5 W/m^2



Transparency measurement (set-up)



Transparency measurement

How to measure:

Inside the black box

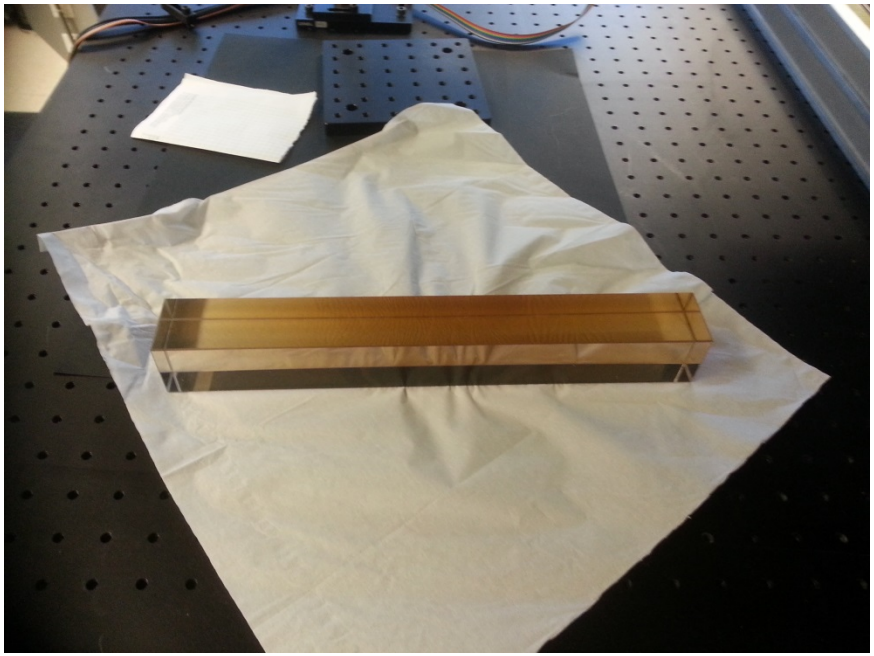
- Measure background (it will be subtracted)
- With the bar out of light beam (a few cm), measure intensity reference (200nm->600nm in 5 nm steps) in nA, 1 s integration. Only once during the whole measurement process.
- Move the bar into the light beam, in the desire position, measure sample intensity (200nm->600nm in 5 nm steps)
- Repeat the acquisition of sample intensity for different positions

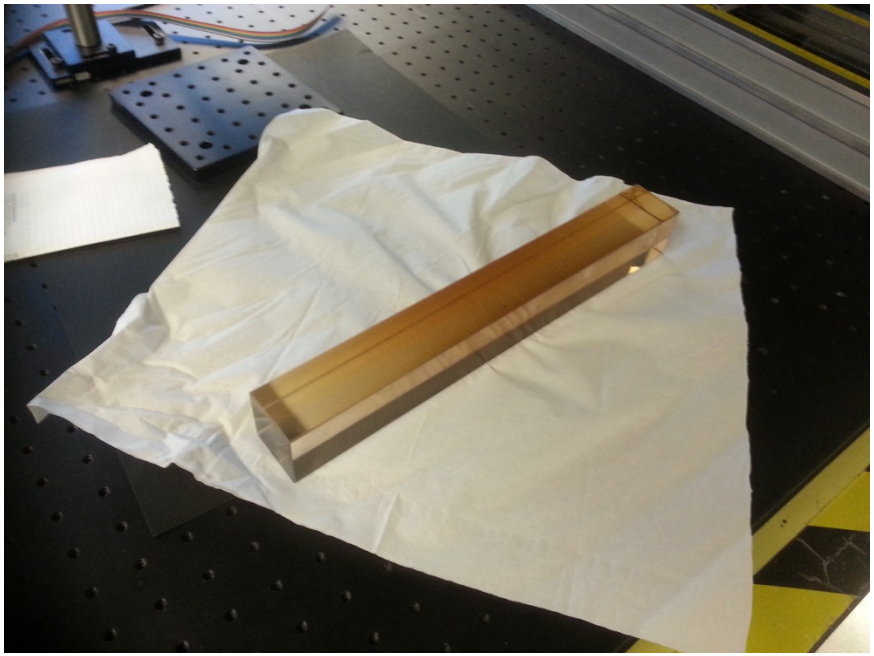
Procedure was made before UV bleaching and after every UV bleaching session.

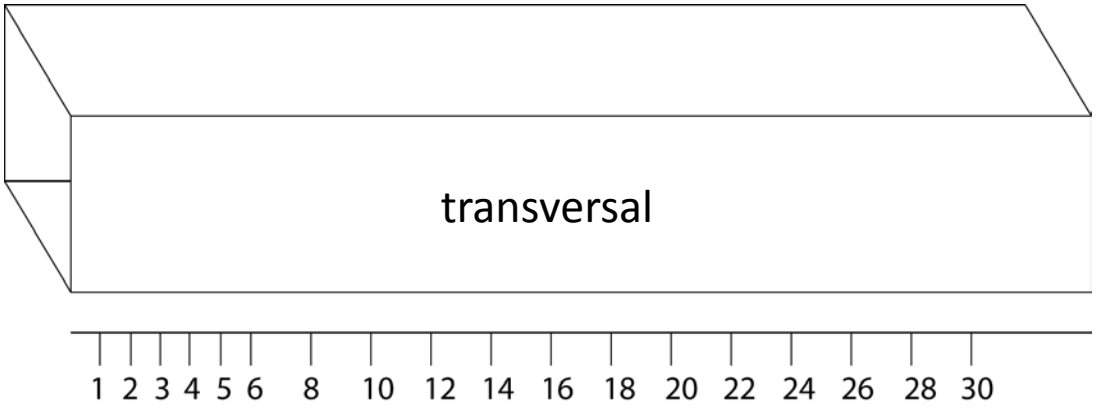
The transmittance, here, is the ratio of the sample intensity to the reference intensity

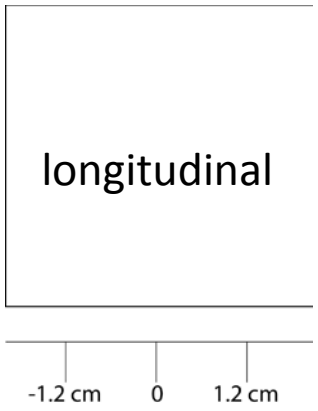
Transparency measurement

- Idaho bar 06 34 cm x 4.3 cm x 4.3 cm Dose: 139 Gy



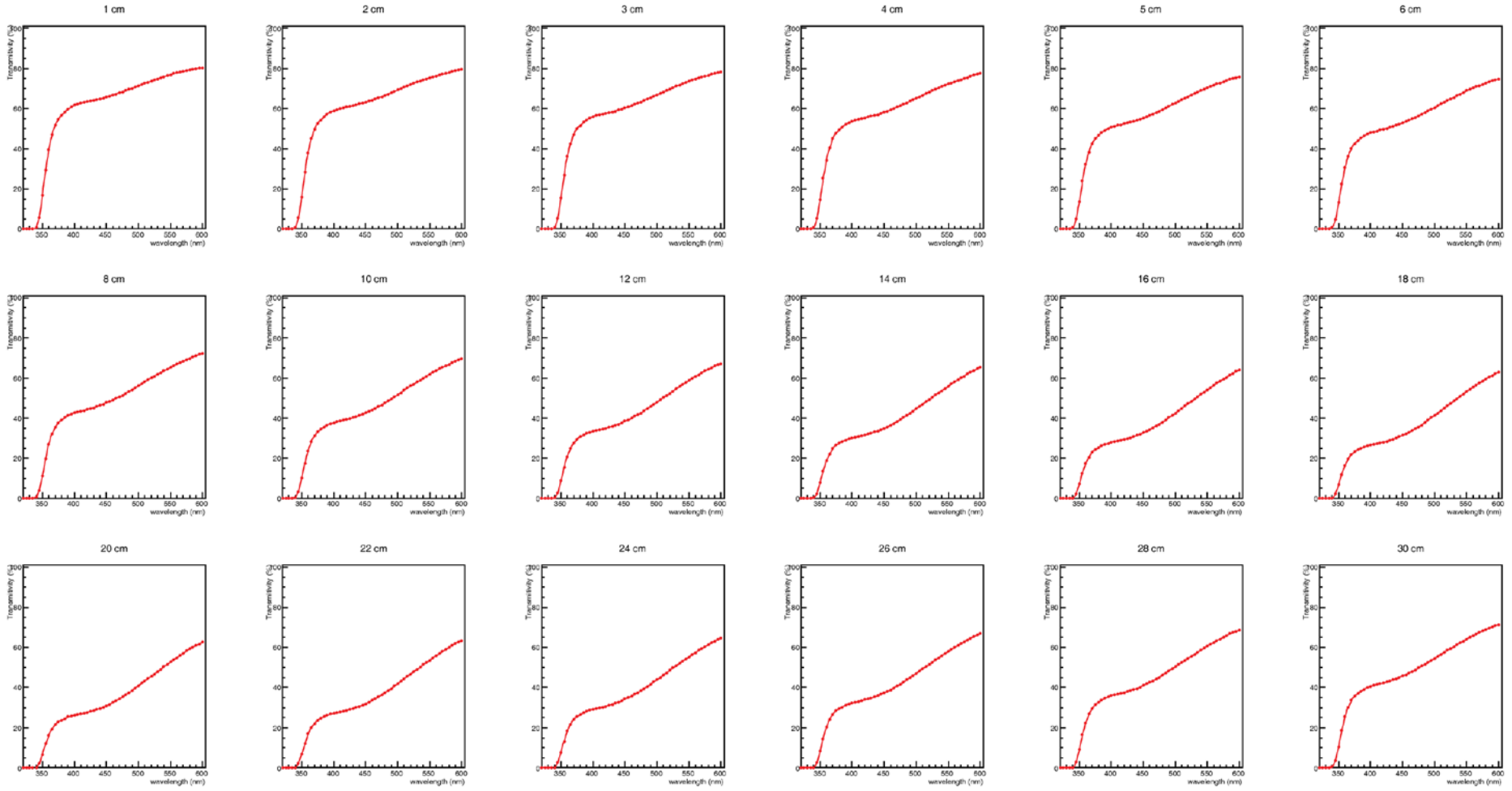






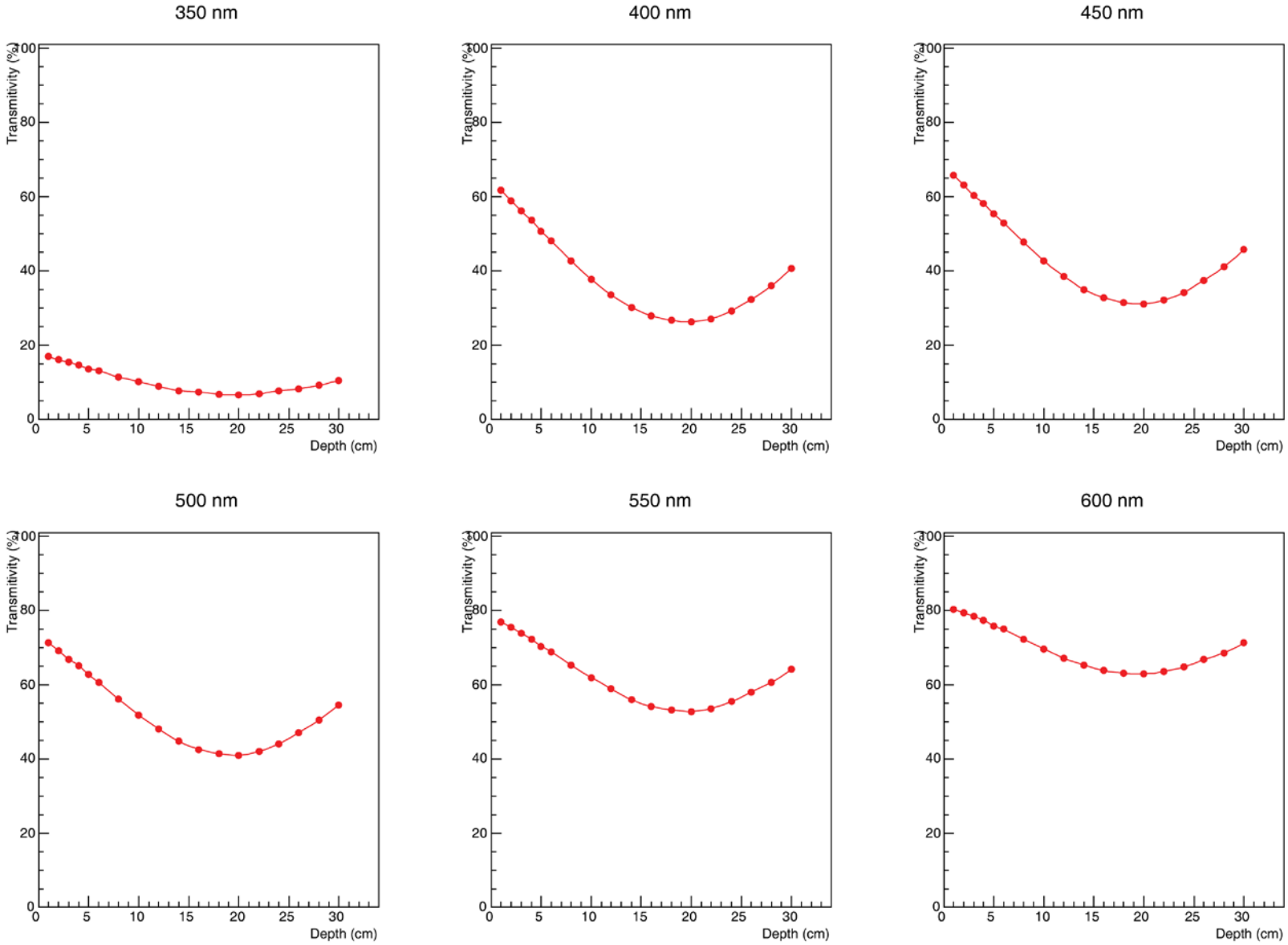
Transparency measurement

Idaho 06 bar was not homogenously irradiated



Transmittance vs wavelength (18 different positions). NO UV LIGHT APPLIED

Transparency measurement

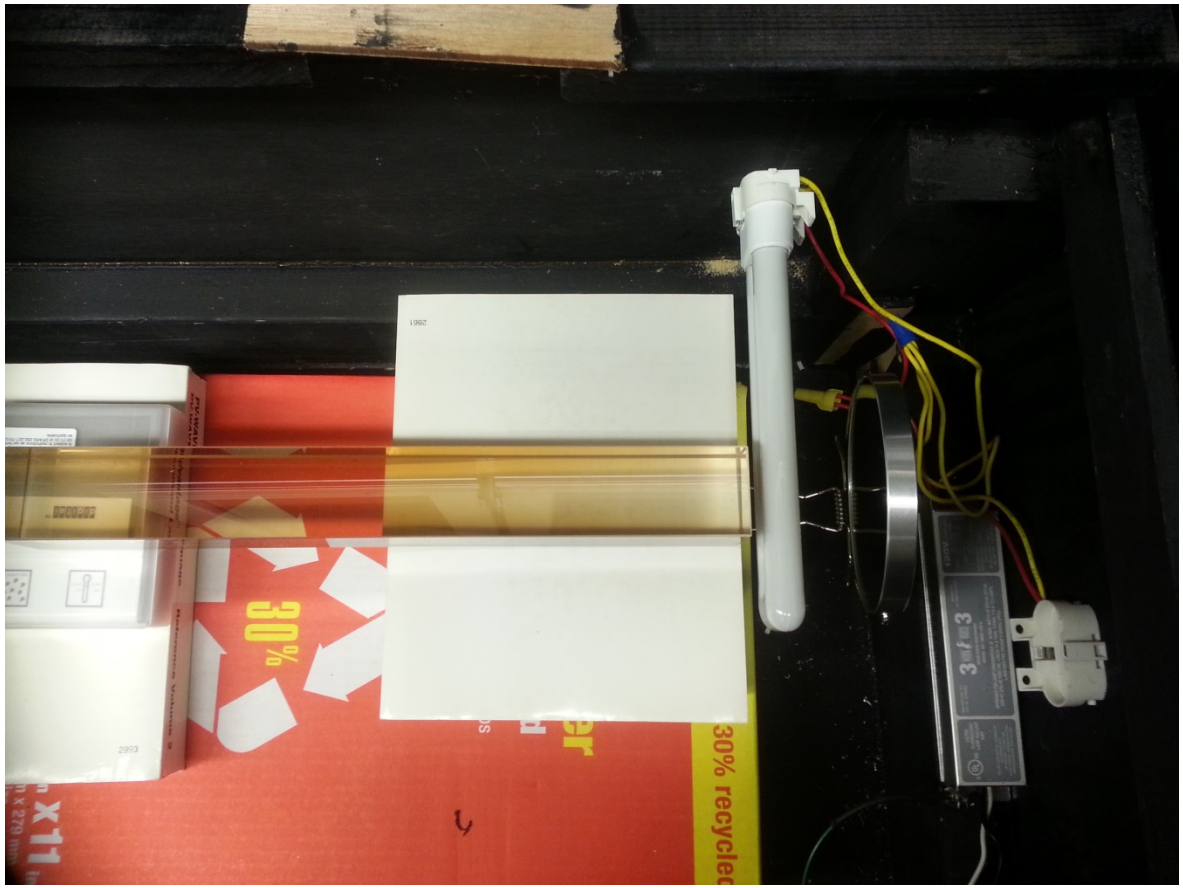


Transmittance vs Depth (for 6 wavelengths) NO UV LIGHT APPLIED

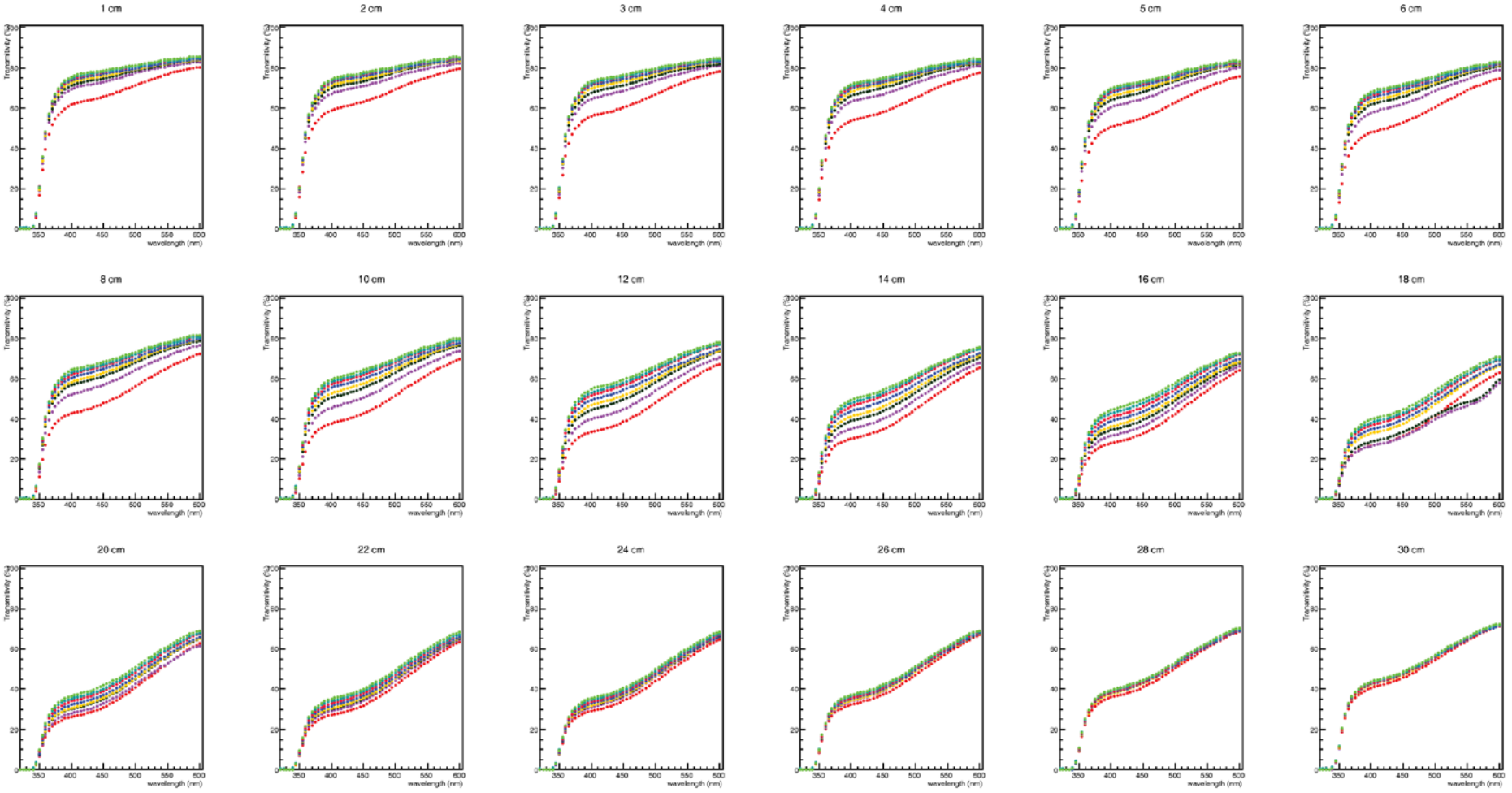
UV bleaching

- The bar was exposed to the lamp as seem in the picture for one hour per session.
- 7 sessions in total.

After every session, the bar was measured transversal and longitudinally.

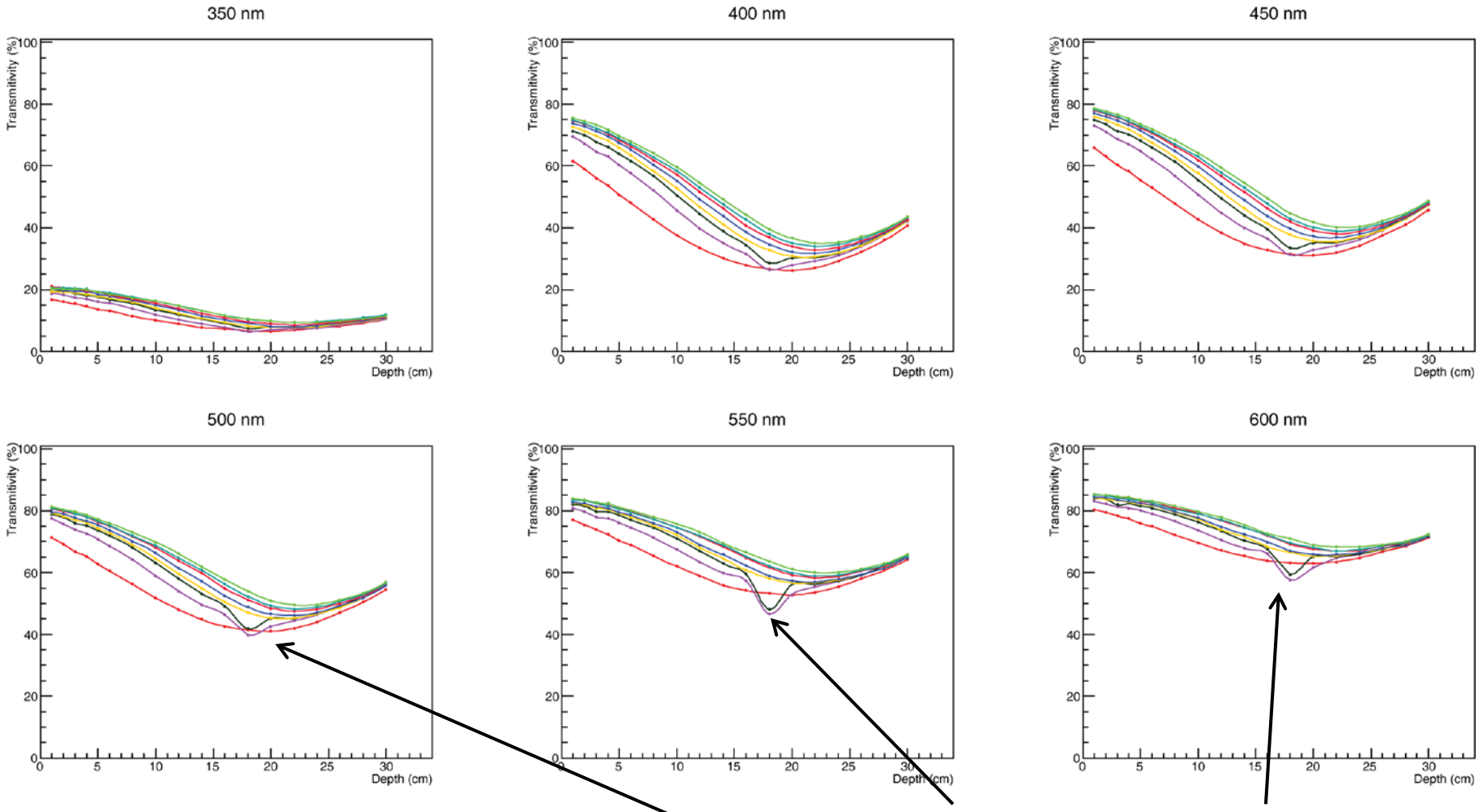


Transversal measurement



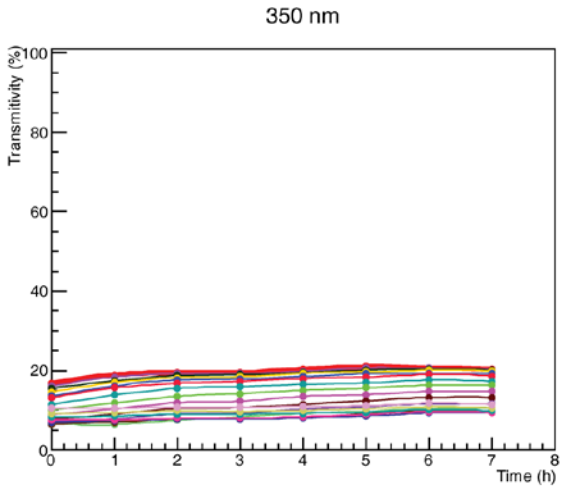
Transmittance vs Wavelength (18 points, 7 sessions/1h)

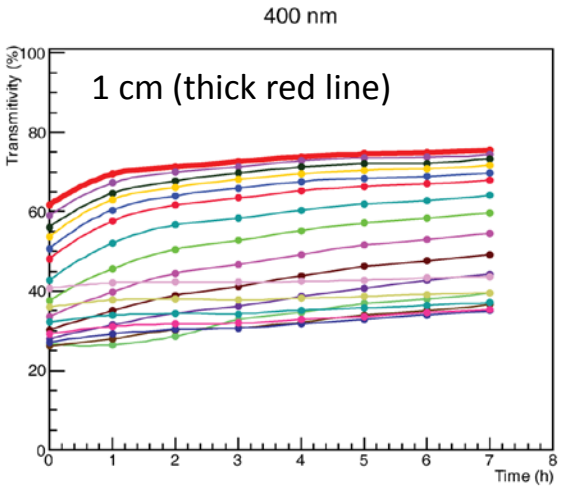
Transversal measurement

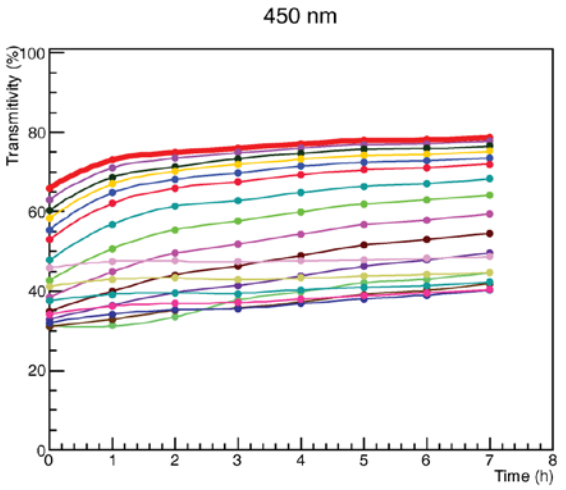


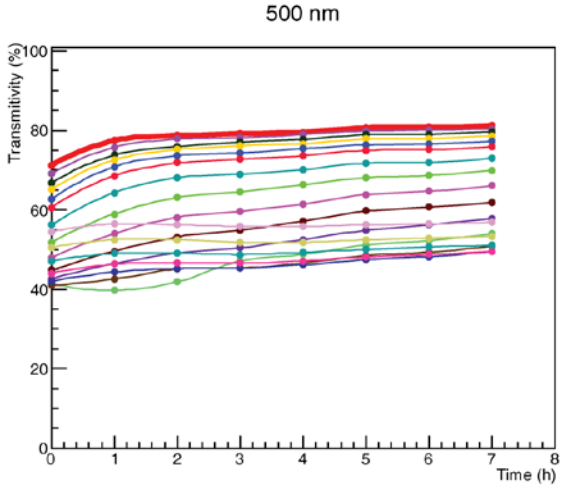
Transmittance vs Depth (6 wavelengths, 7 sessions/1h)

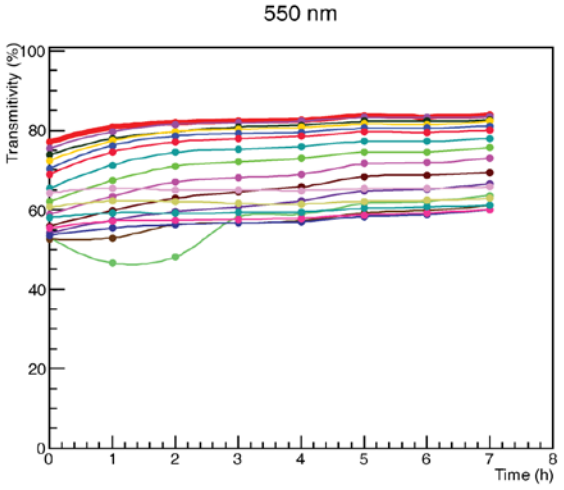
Transversal measurement

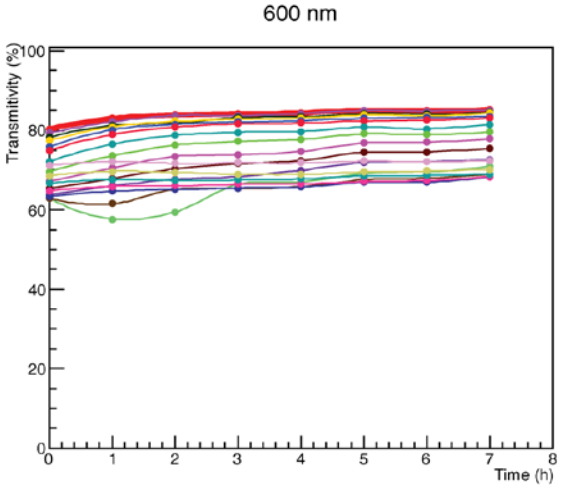






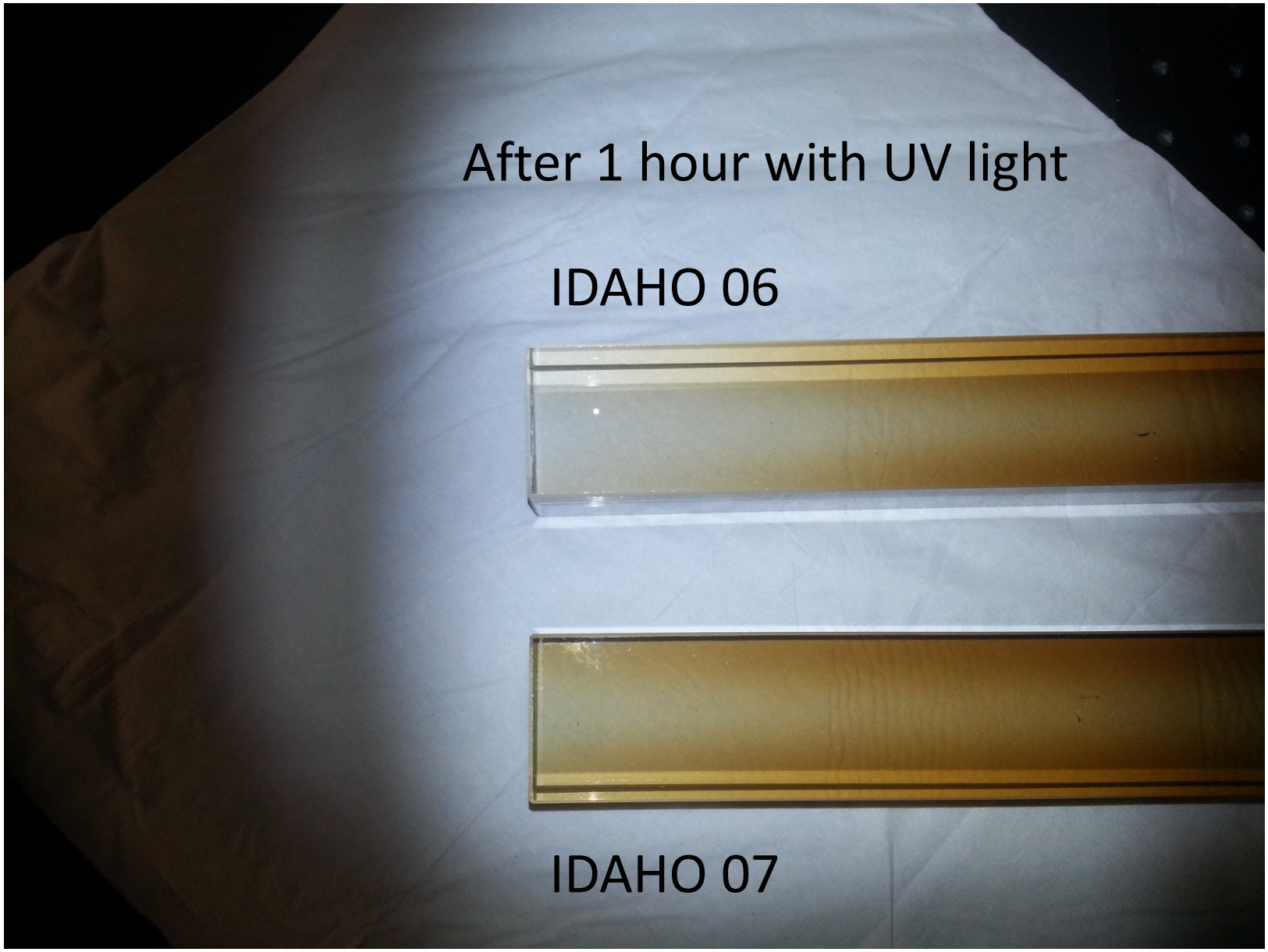




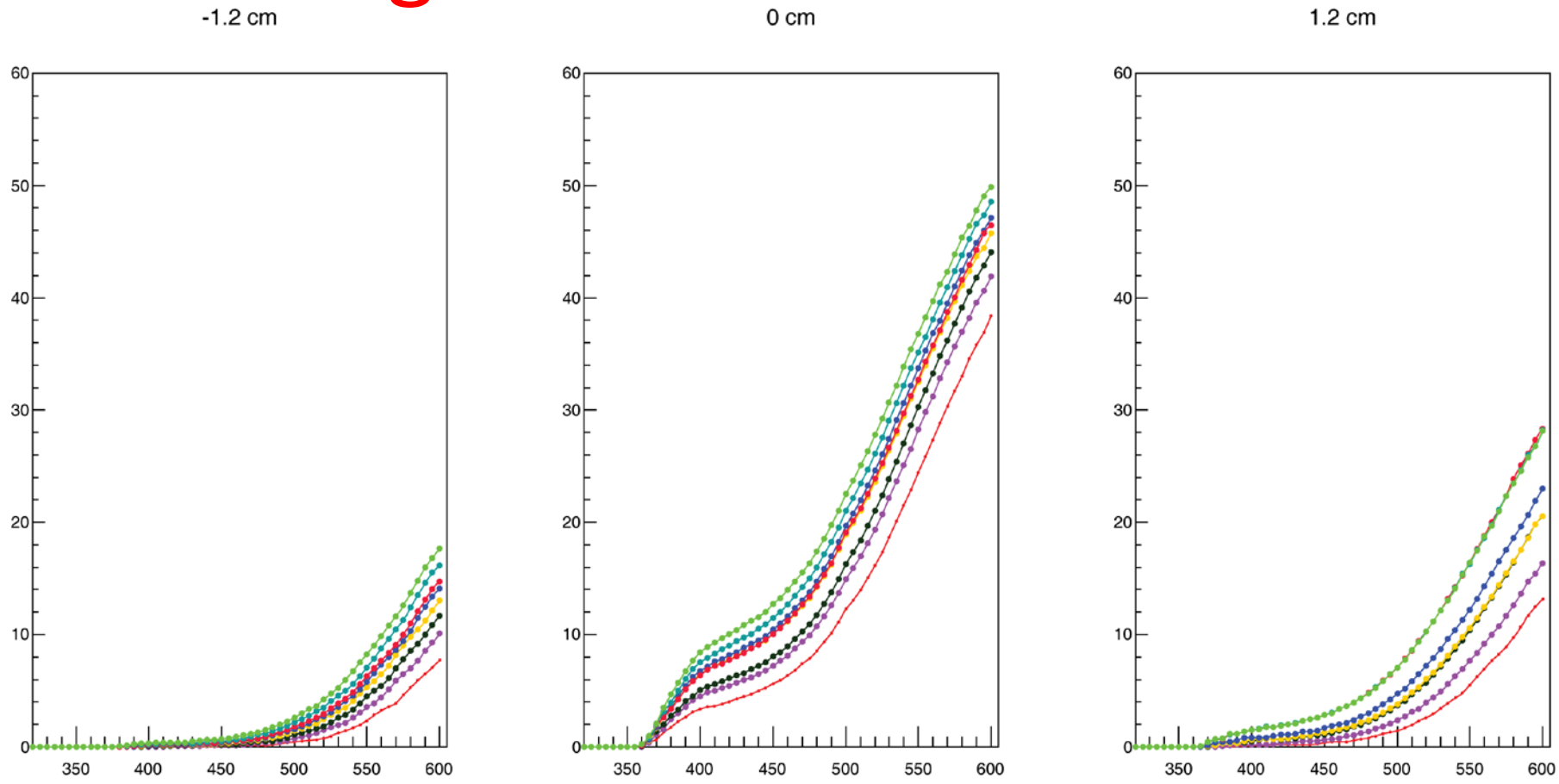


Transmittance vs time (session) (6 wavelengths, each line 1 position)

UV Bleaching



Longitudinal measurement

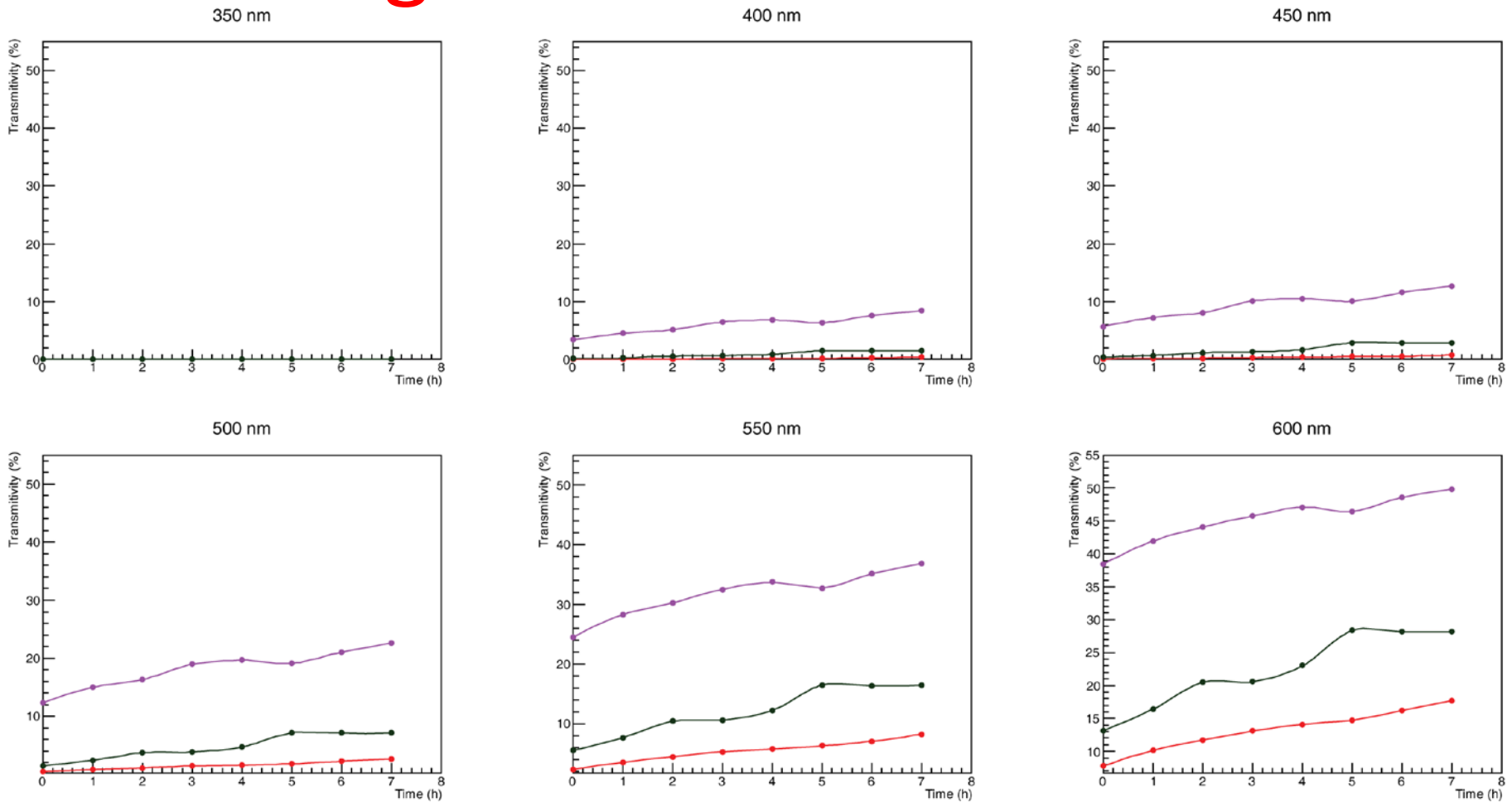


Transmittance vs wavelength (3 different positions)

The difference between both sides could be:

- inhomogeneity or
- Not well centered (0 cm is not the geometrical center of the bar)

Longitudinal measurement



Transmittance vs time (session) (6 wavelengths, each line 1 position)

Preliminary conclusions (more analysis needed!!)

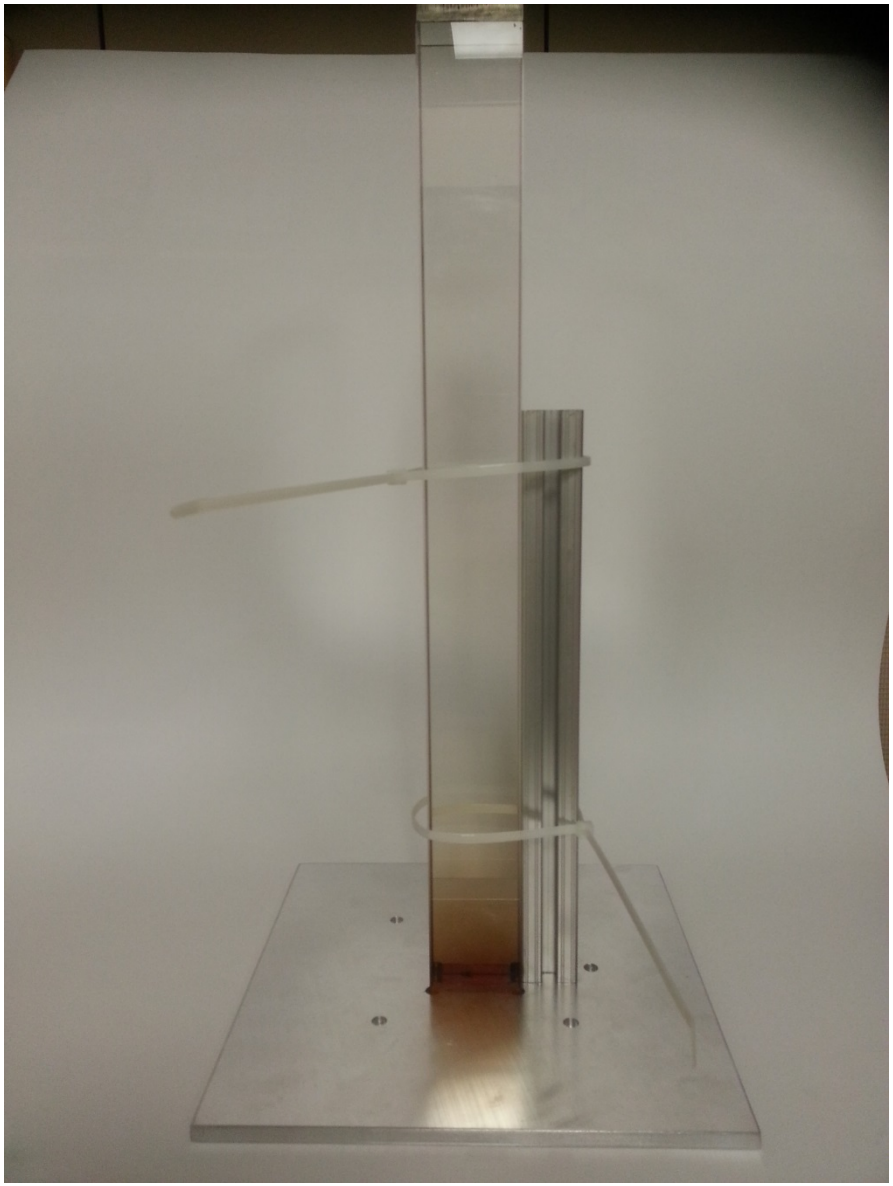
- Idaho 06 was useful to study the depth of the bleaching with the new lamp for certain time.
  - After 4 hours, the first 4-5 cm show saturation ~80% transmittance (ideal T~88% no loses)
  - After 7 hours, the maximum depth where UV has bleached is around ~20-25 cm.
- For our future purposes, Idaho bars are not quite useful:
  - Main damage occurs in the first centimeters of the bar (Idaho bars are damage along the whole bar)

Future steps

Study the bleaching process with damaged bars from a Cs137 source from RADCON (~280mR/h)

Present, we have only one (see picture), exposed during a weekend.

We expect to have more in future.



Future steps

4 bars were placed close to the scattering chamber in Hall A, in order to exploit the radiation from target to damage the bars