pTP Coating Thickness Measurement

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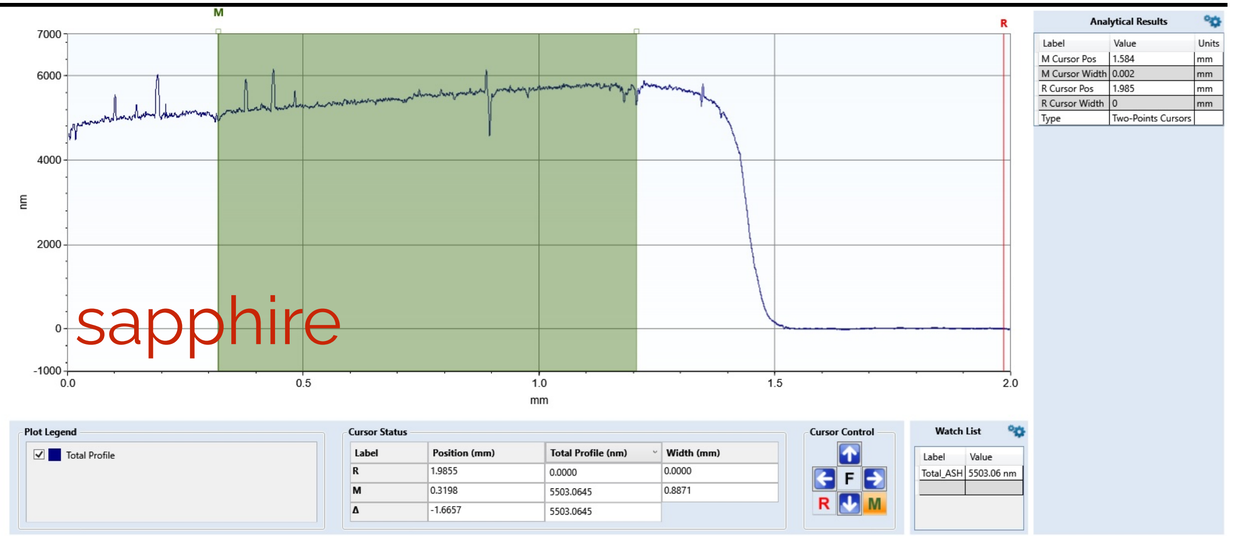
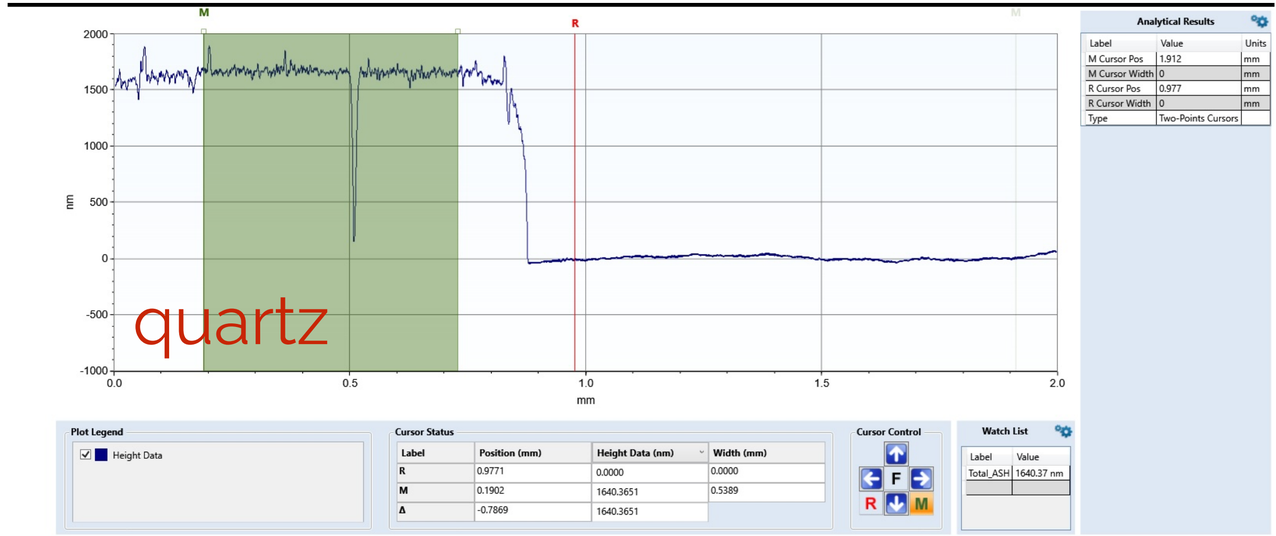
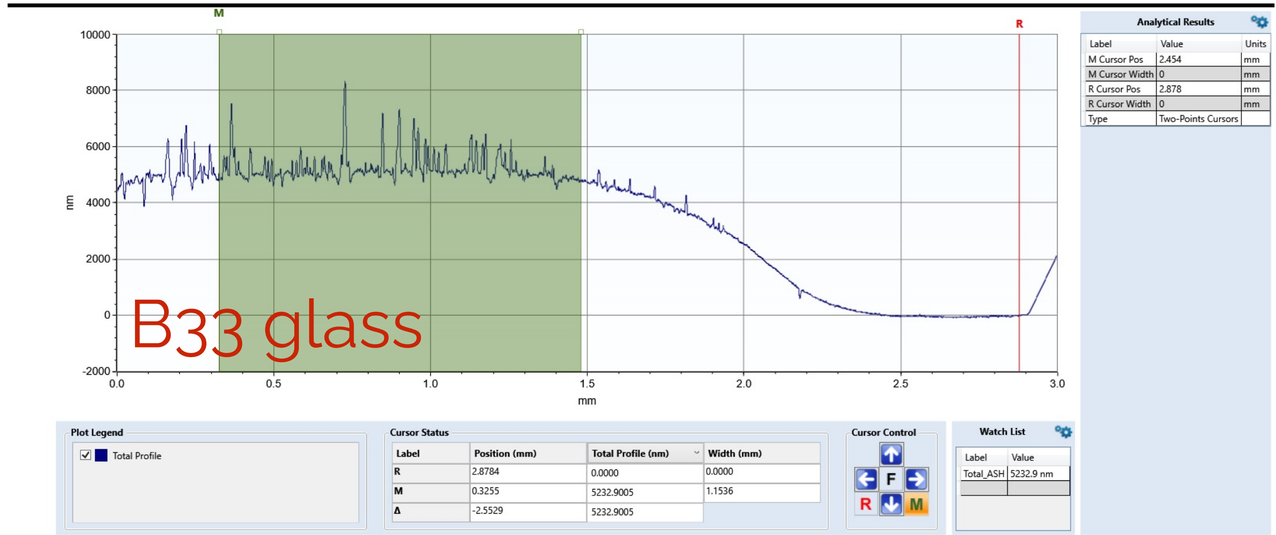
Brookhaven
National Laboratory

Thickness measurements from Abdul

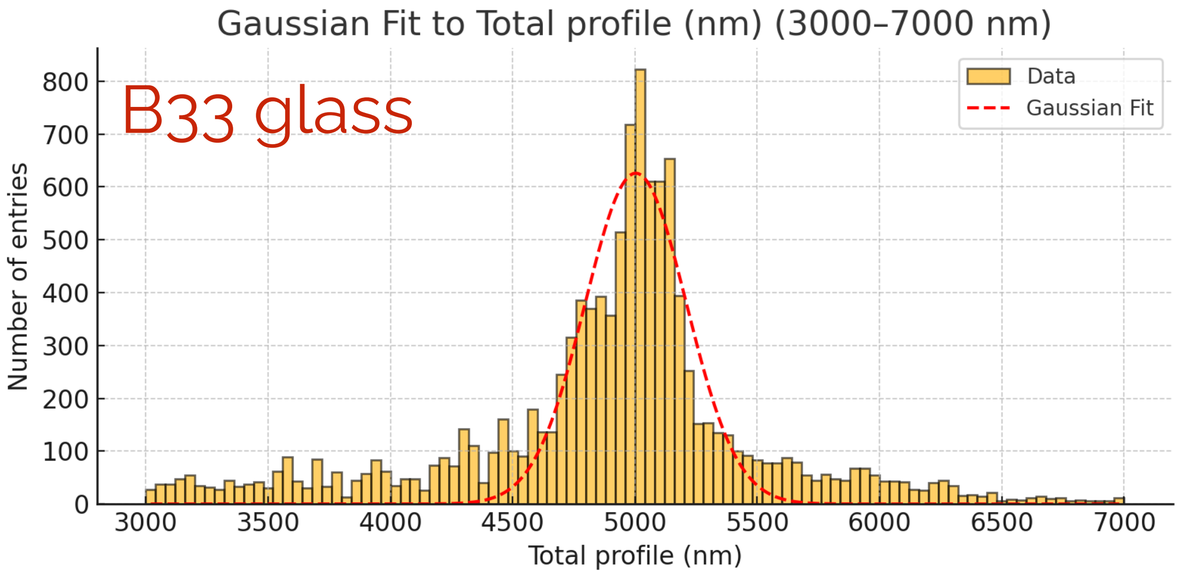


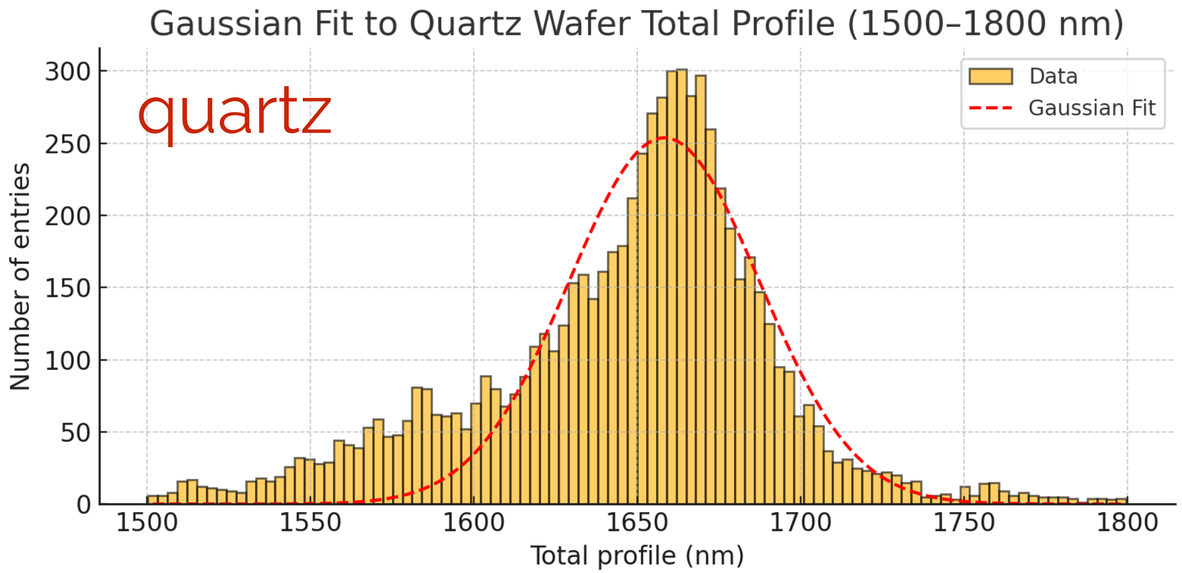


- measurements performed with profilometer, not ellipsometer
  - Abdul: “This relies on having some sort of step in the film and we scan a sensitive tip across the edge. No fitting required once you get the data. As long as the profilometer is calibrated (which it was) the step height can be easily measured. The resolution is down to few nms. Unlike ellipsometer it only gives you step height and some idea of roughness. No optical properties.”
- quartz have targeted thickness of ~1.5um, where both sapphire and B33 sample have much thicker coating
- thickness variation is pretty small in sapphire and quartz: largest variation is at around 1um or smaller
- but thickness variation in B33 is larger, >1um level



Thickness measurements from Abdul

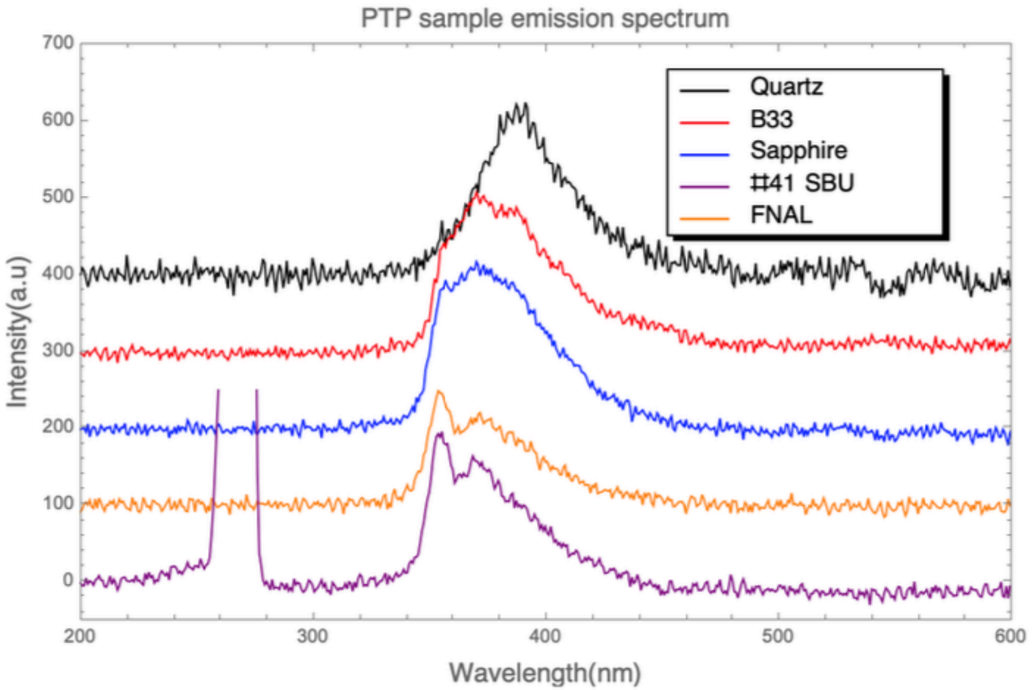




- Amplitude (amp) ≈ 324,622
- Mean (μ) ≈ 5003.44 nm
- Standard Deviation (σ) ≈ 206.98 nm

- Amplitude (amp) ≈ 18,564
- Mean (μ) ≈ 1658.31 nm
- Standard Deviation (σ) ≈ 29.20 nm

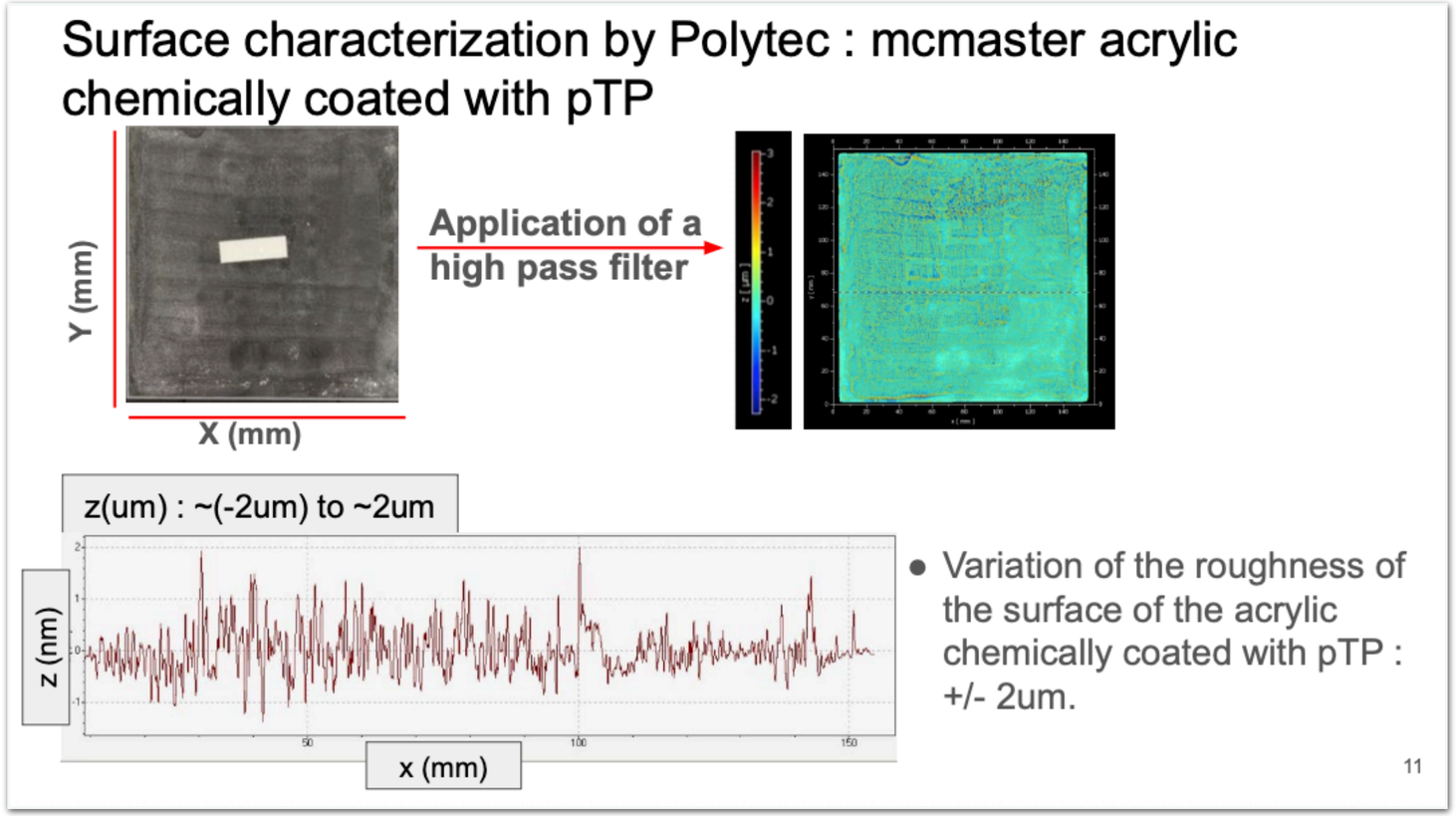
Emission spectrum



LFO sample measurement @BNL, with others

SBU brushed coating sample

- SBU sample (brushed) show +/- 2um thickness variation
- expect better smoothness with “sprayed” sample?



Few words from Abdul

- “I used a generic Cauchy model to obtain optical parameters in a wide range of incident wavelength. **The film is rather rough which makes it difficult to get meaningful data.** I will keep trying.”

- “**From visual inspection you can see that the film is rough.** Under profilometer you see that the film surface is rough. **AFM would give a good idea of roughness.**”

- “The ellipsometer relies on shining light with known polarization and measuring change in polarization of reflected light (Jones Matrix). **If the surface is rough the change in polarization shown some singularity which makes data fitting very difficult.** I tried to make the beam small but did not help much. I am still seeing if there are ways I can get around this.”