



U.S. DEPARTMENT OF
ENERGY



UNIVERSITY OF
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Experience from running the International Glazing Database Inter- laboratory comparison

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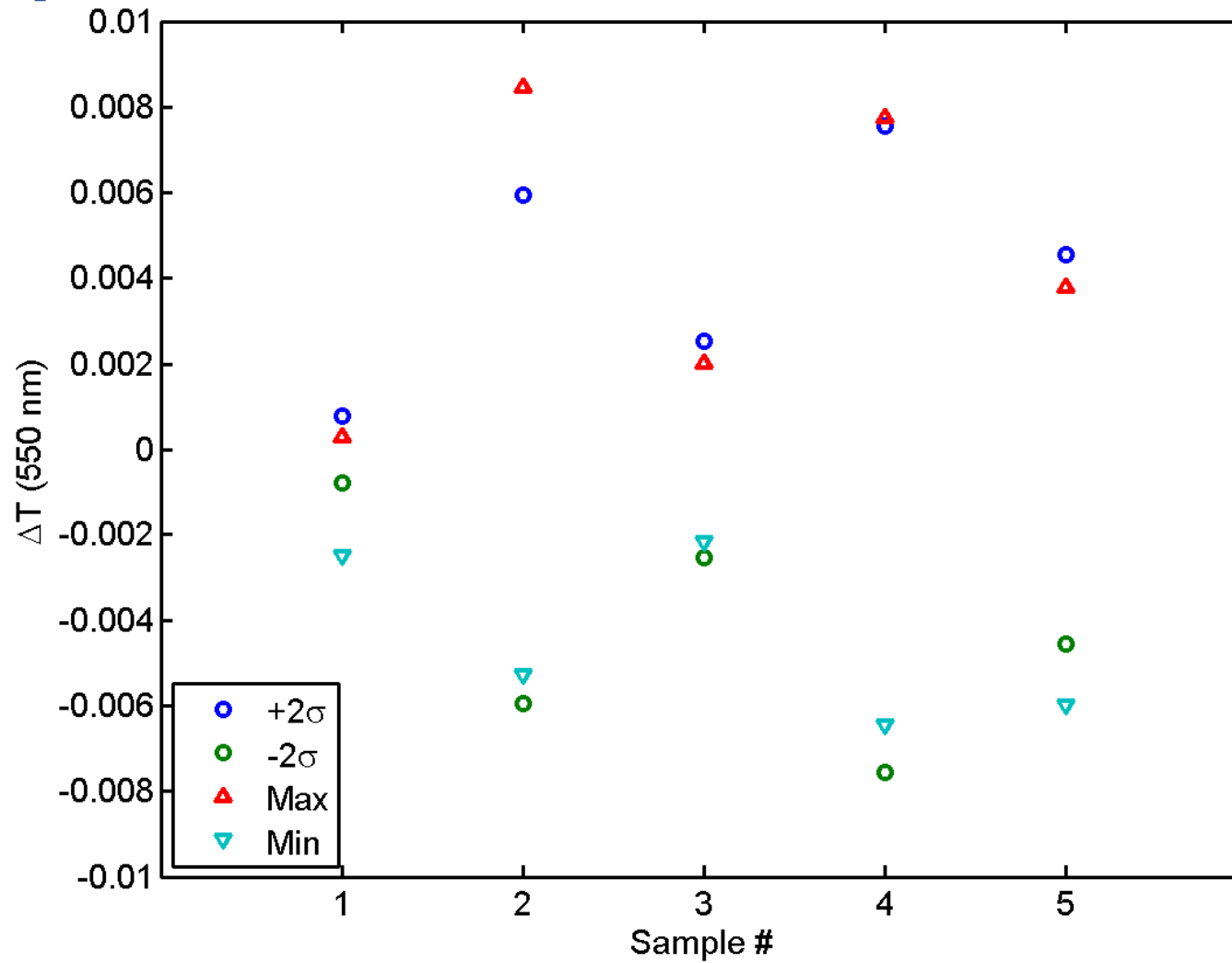
Goal

- Passing this inter-laboratory comparison (ILC) is a requirement for IGDB data submitters
- NFRC tolerances are 1% for transmittance and 2% for reflectance and emissivity
- Iron out systematic errors
- Improve IGDB process, feed back to standards work

Sample selection

- **Monolithic glass:** Very low variation between specimens.
- **Metallic low-e:** High reflectance and opaque in NIR.
- **Laminates**
 - All glass form same production run
 - Lamination of the low-e film allows some protection

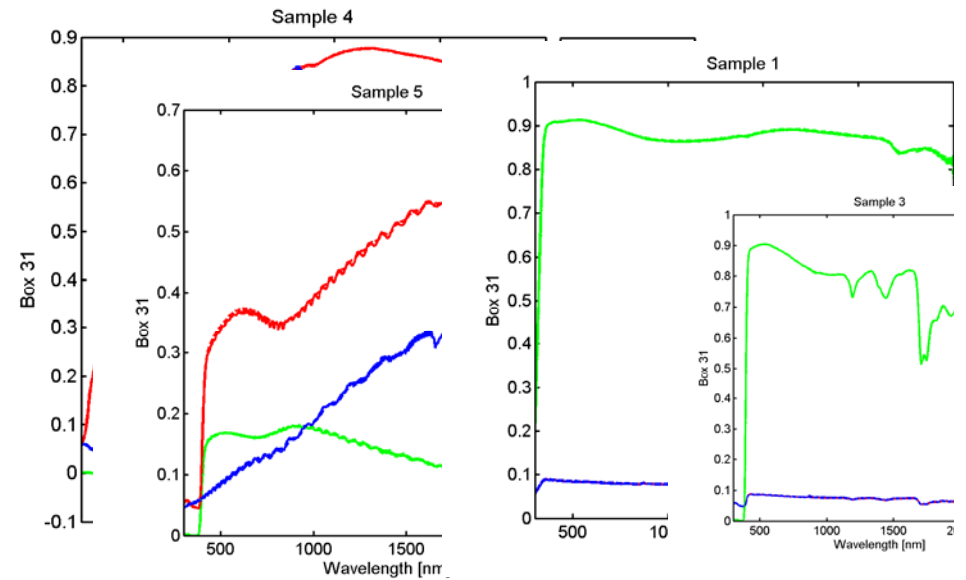
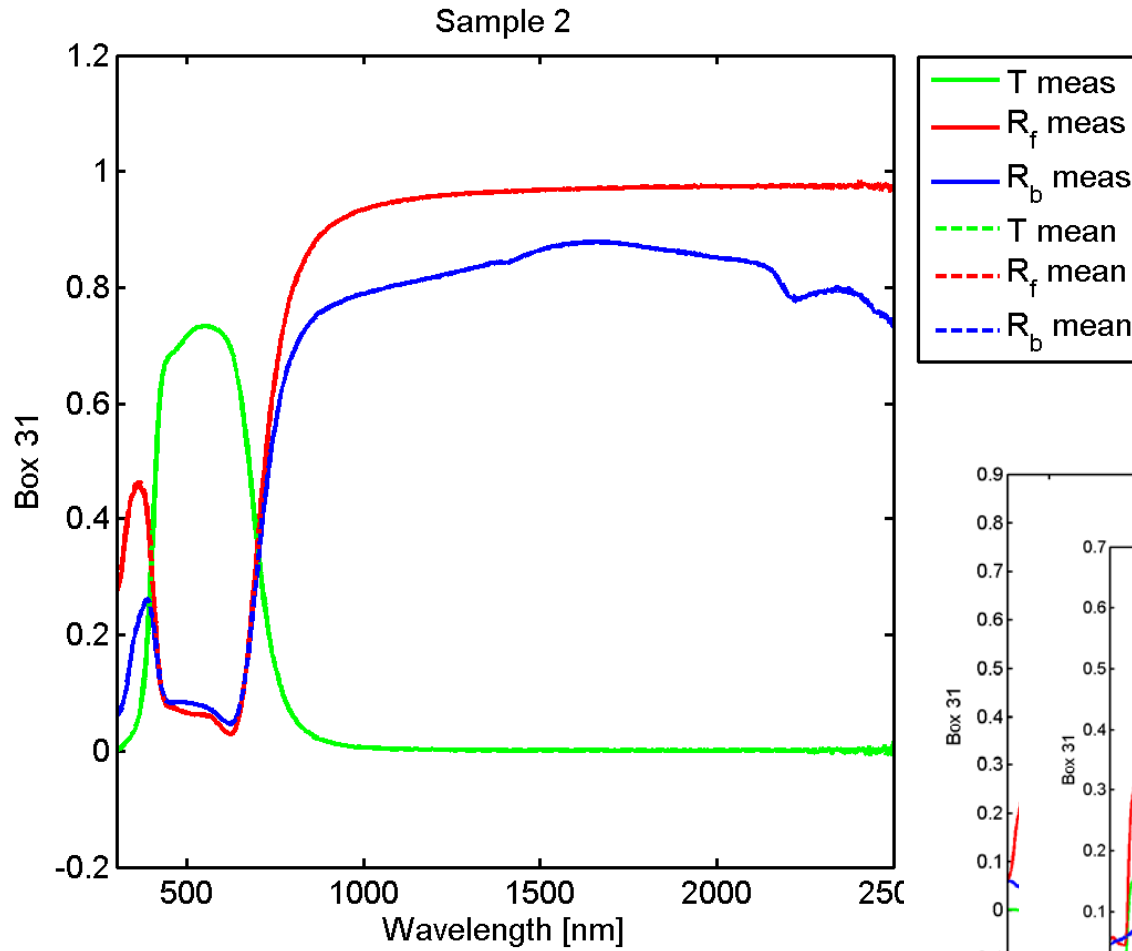
Sample variation



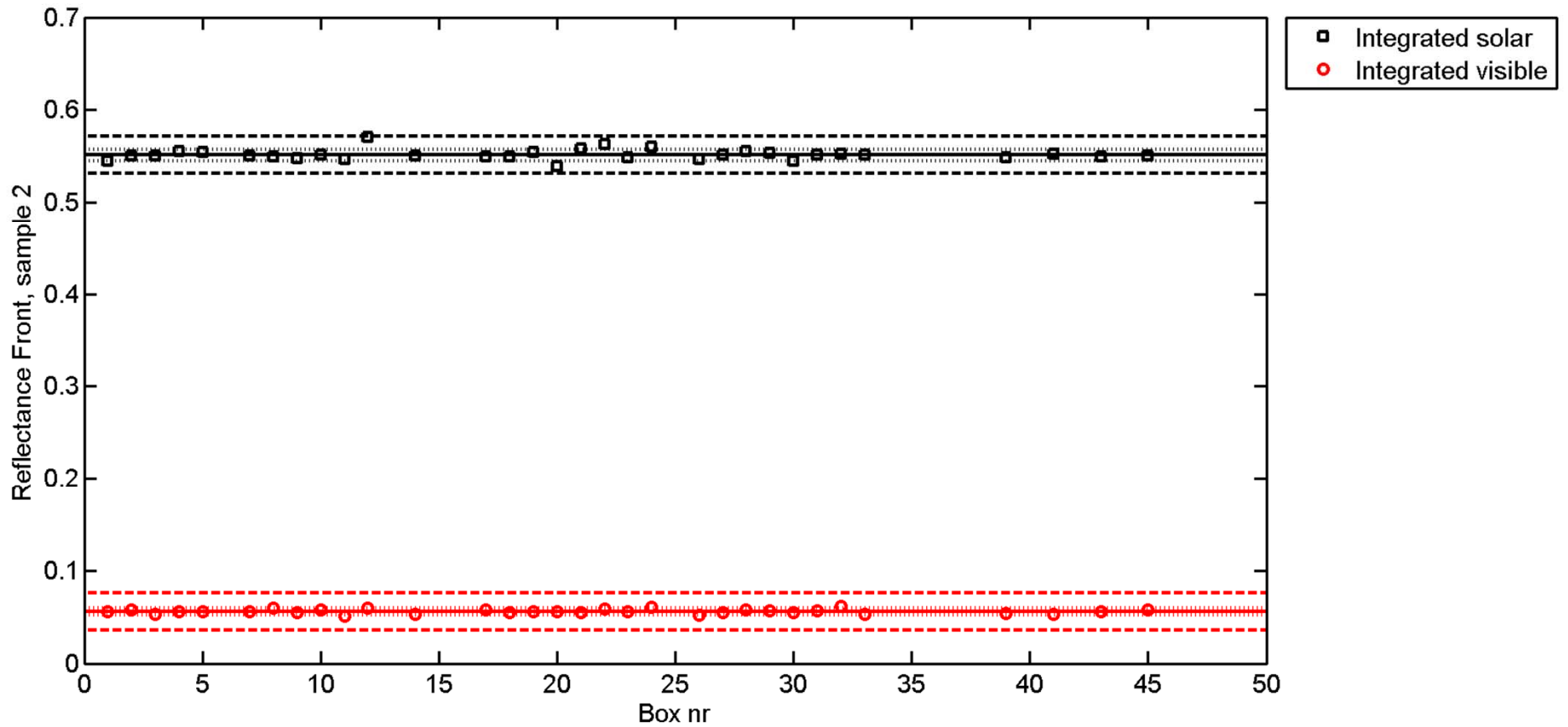
Current status

- Results are improving as they are being reviewed and inconsistencies being taken care of.
- Part of this exercise is to improve the general quality of the measurements.

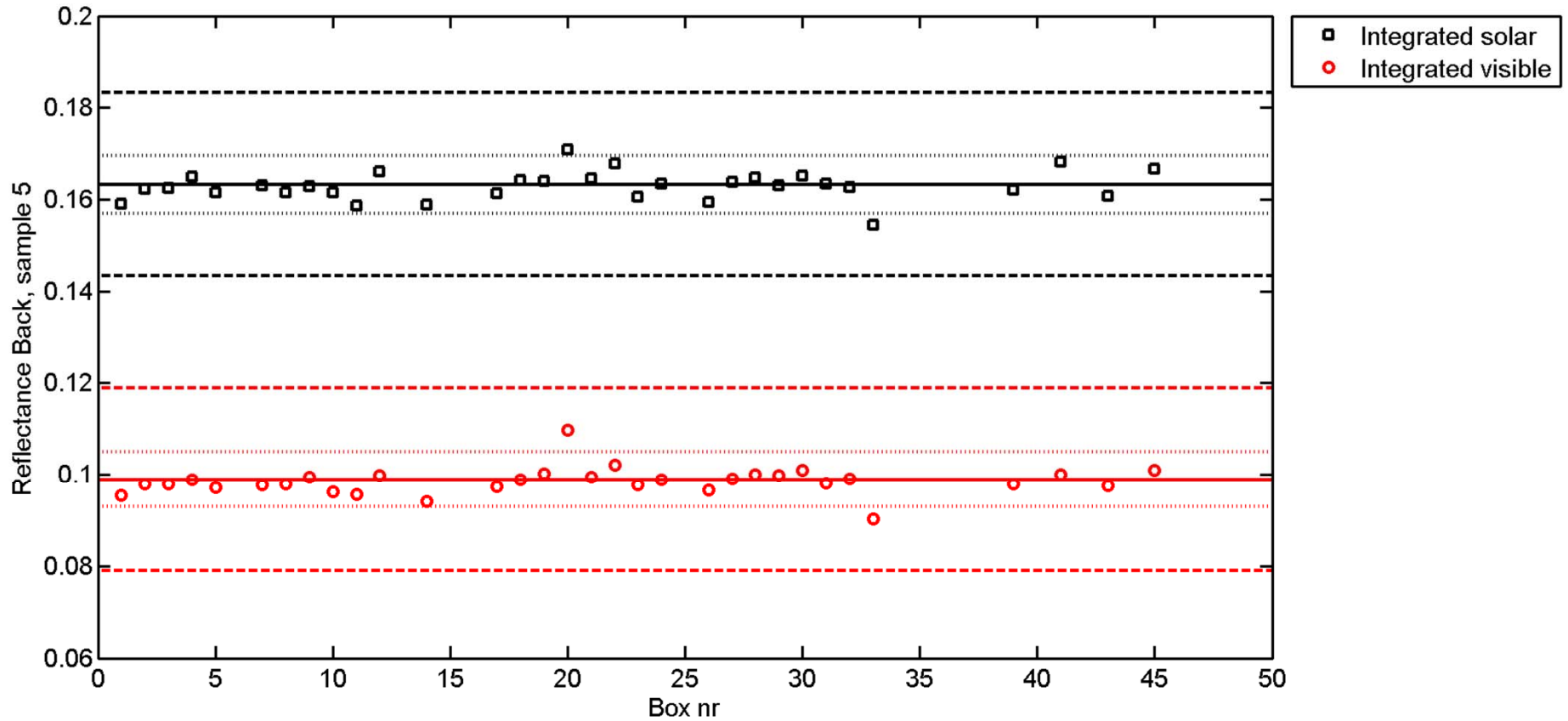
Individual results



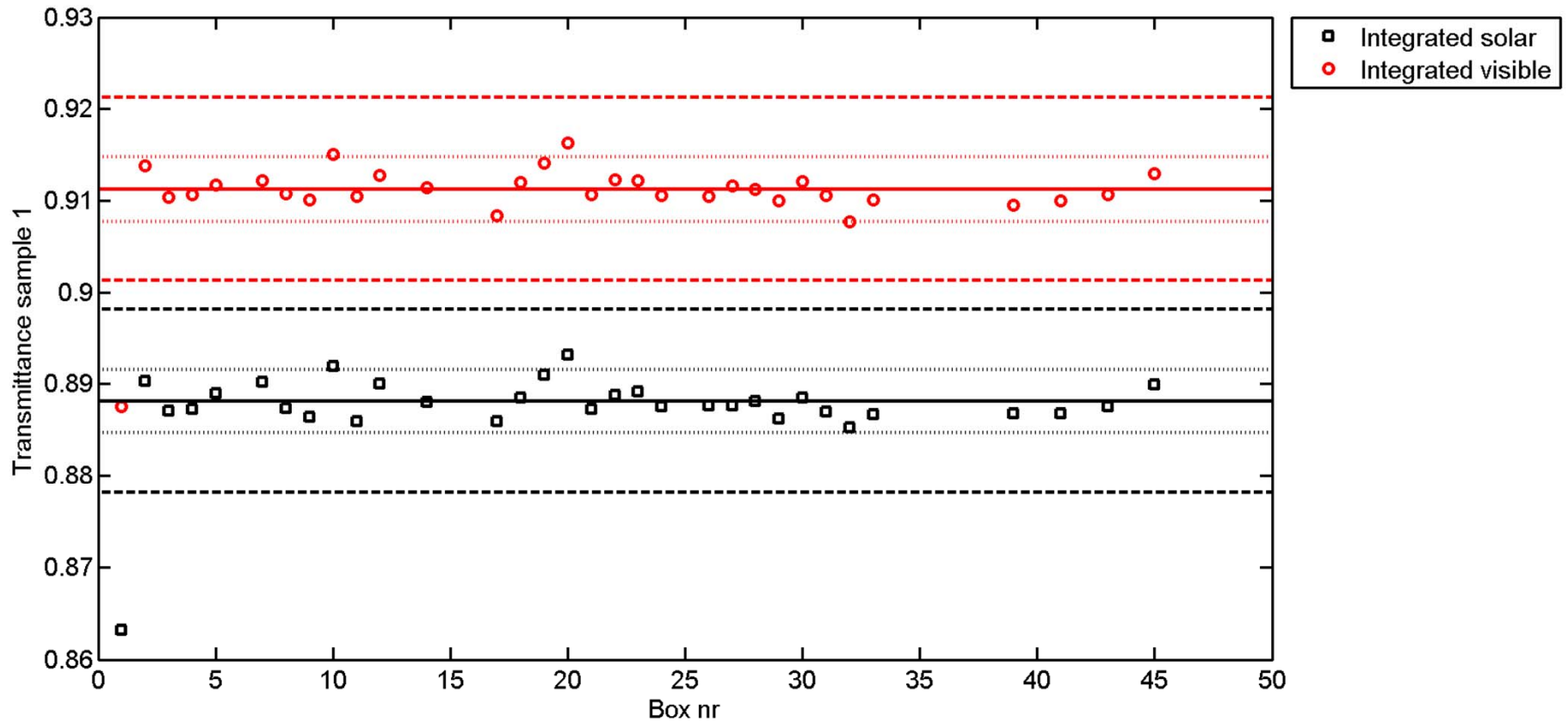
Results – reflectance low-e coating



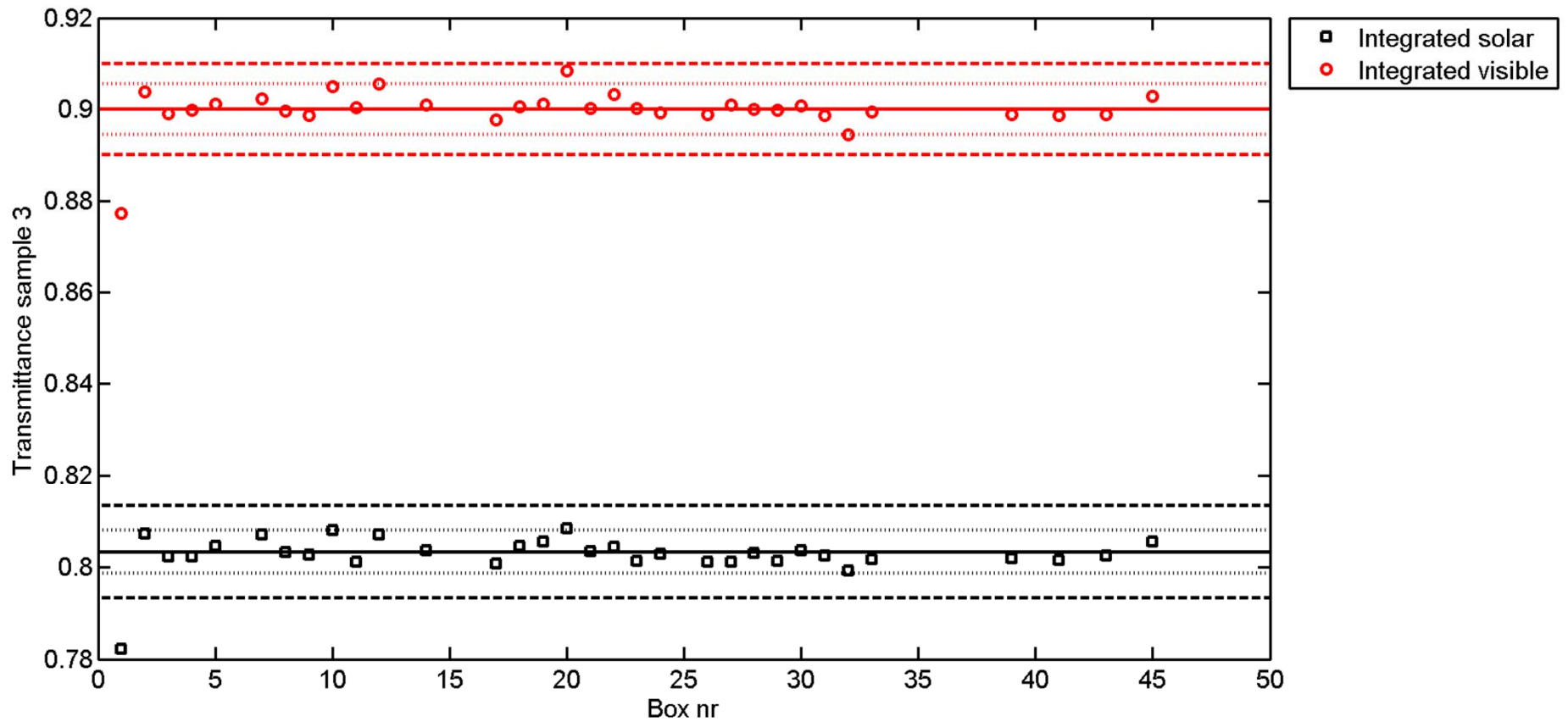
Results – reflectance applied film



Results – transmittance low-iron glass



Results – transmittance clear laminate



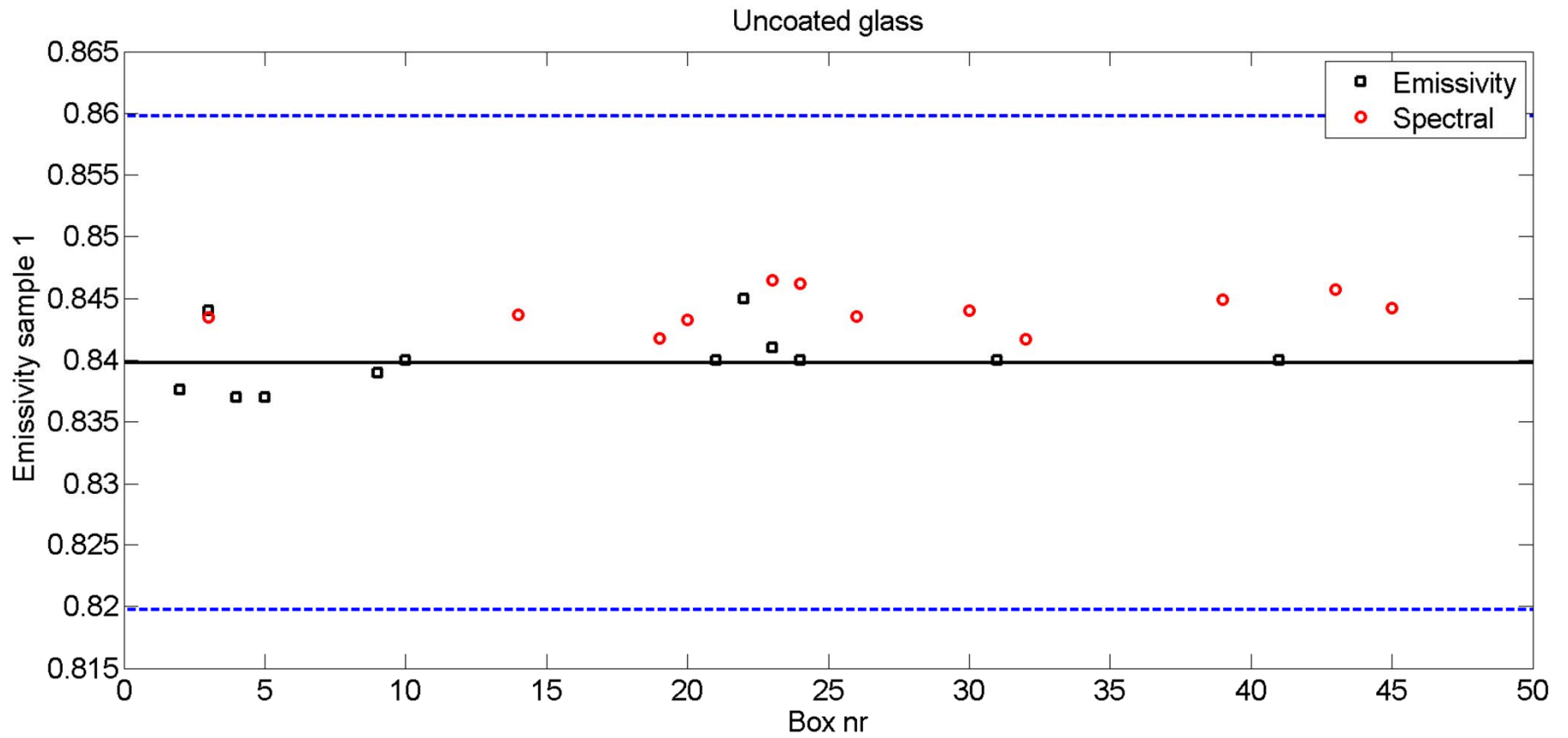
Conclusions – UV/Vis/NIR

- The 1% tolerance for transmittance is manageable.
- Some but not all samples looks like the tolerances for reflectance could be tightened, but only for some samples and for those, only after at least one iteration of troubleshooting.

Results emissivity

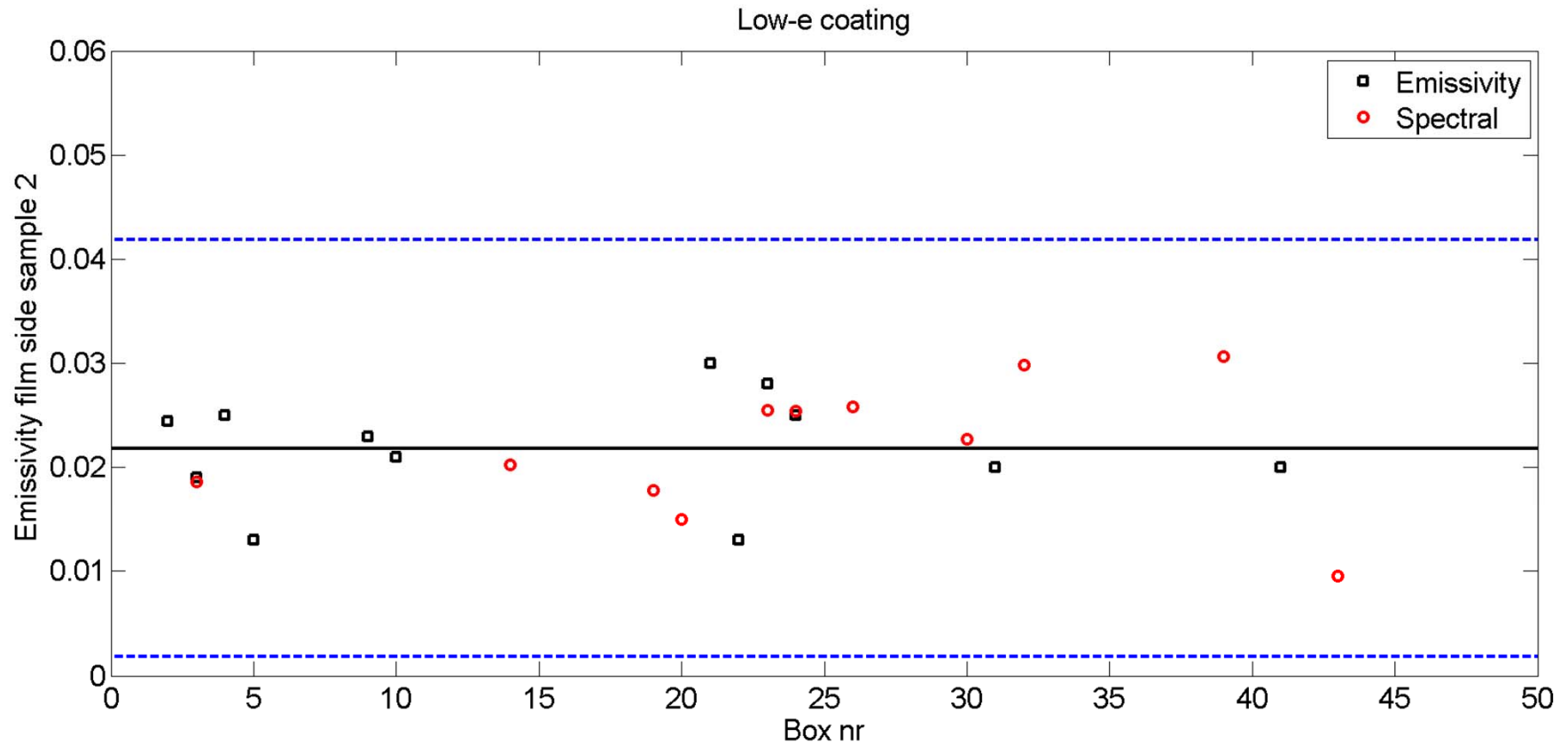
- 8 surfaces was uncoated glass, the same uncoated glass. Good for testing instrument stability.
- 1 low-e coating
- 1 applied film

Results – emissivity clear glass

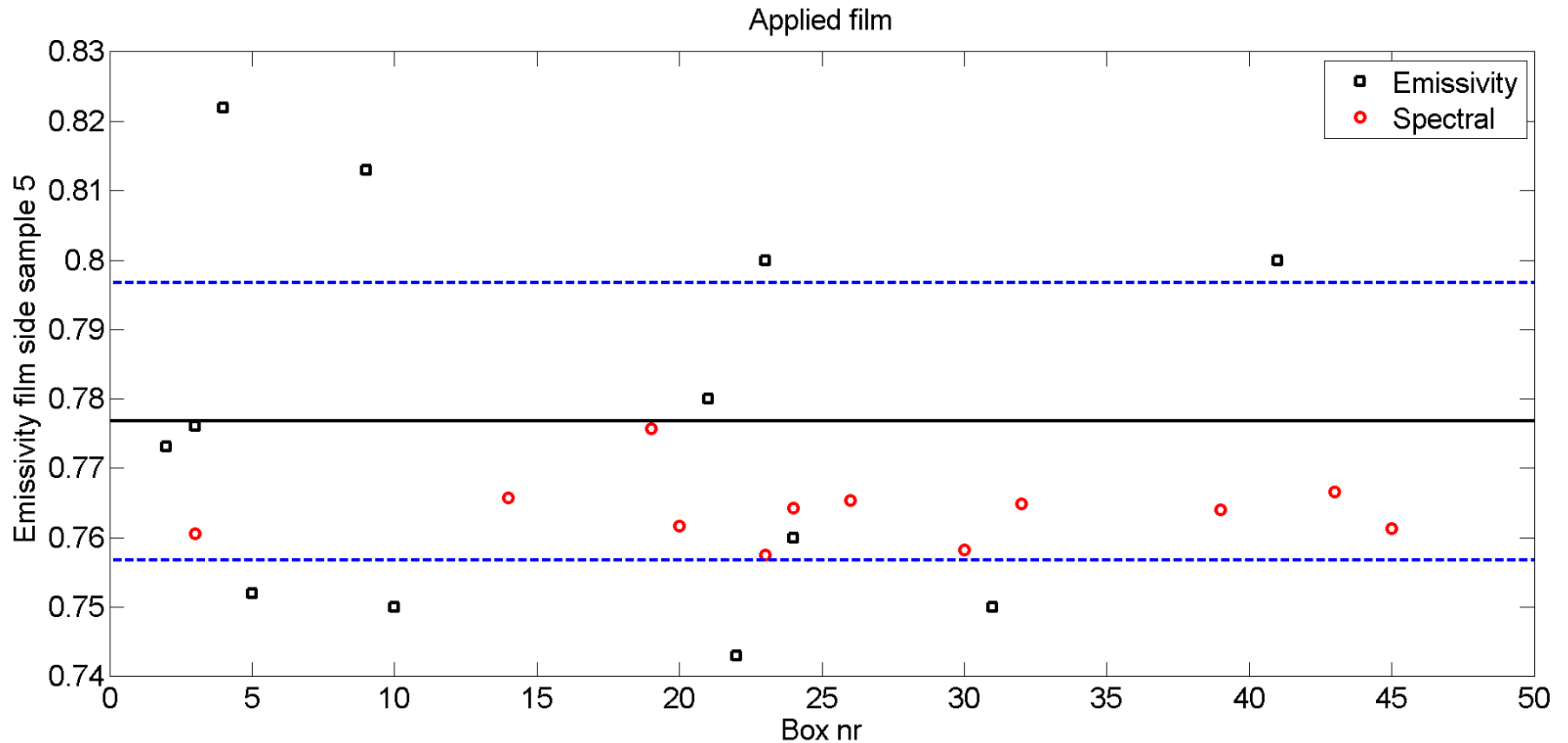


Results – emissivity low-e

1 outlier removed and 3 retakes



Results – emissivity applied film no retakes no outliers removed



Conclusions – Emissivity

- Moving to 1% tolerance for emissivity is not practical for low-e coatings.
- Applied film data had more outliers, not yet resolved.
- Too little data on emissometers to be conclusive, 1 good, 1 bad that remeasured and got good results

Complex glazing ILC

- Phase II is being initiated.
- Focus on Instructions for phase II.
- Any opinions on how that should be conducted compared to phase I should be put forward as soon as possible.

Questions? Comments?



Bonus material

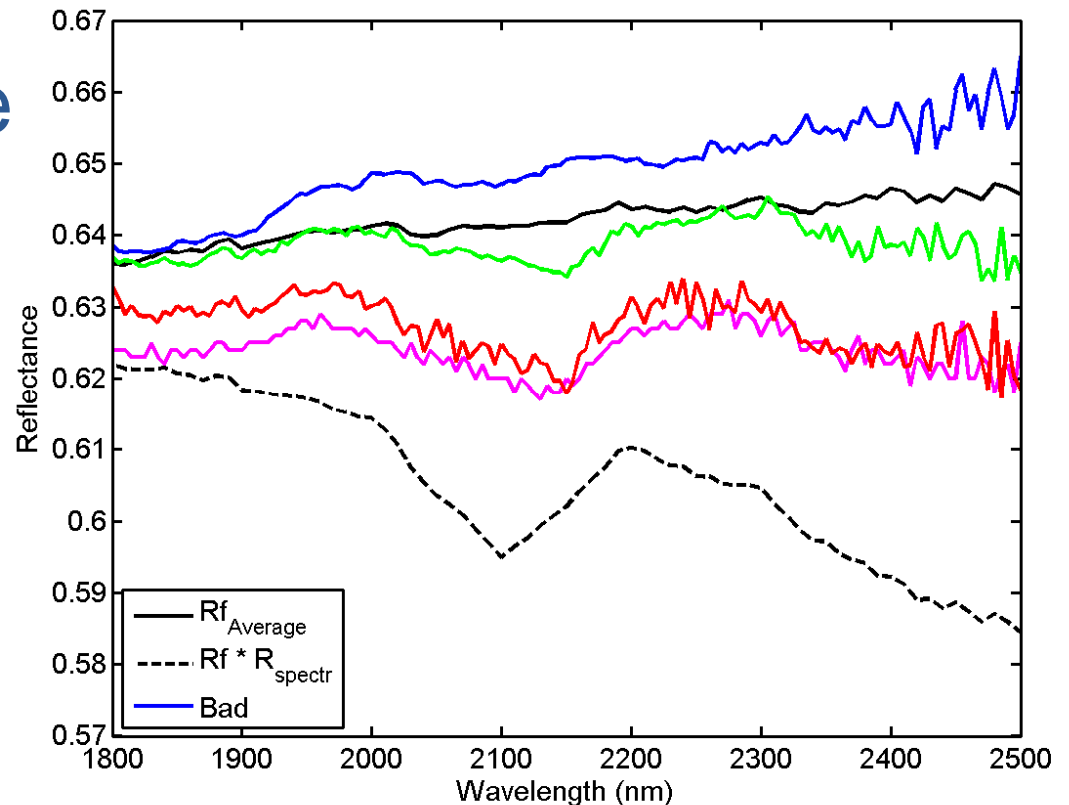
- Following slides covers some lessons learned and are of technical interest for a limited amount of people.

Lessons learned

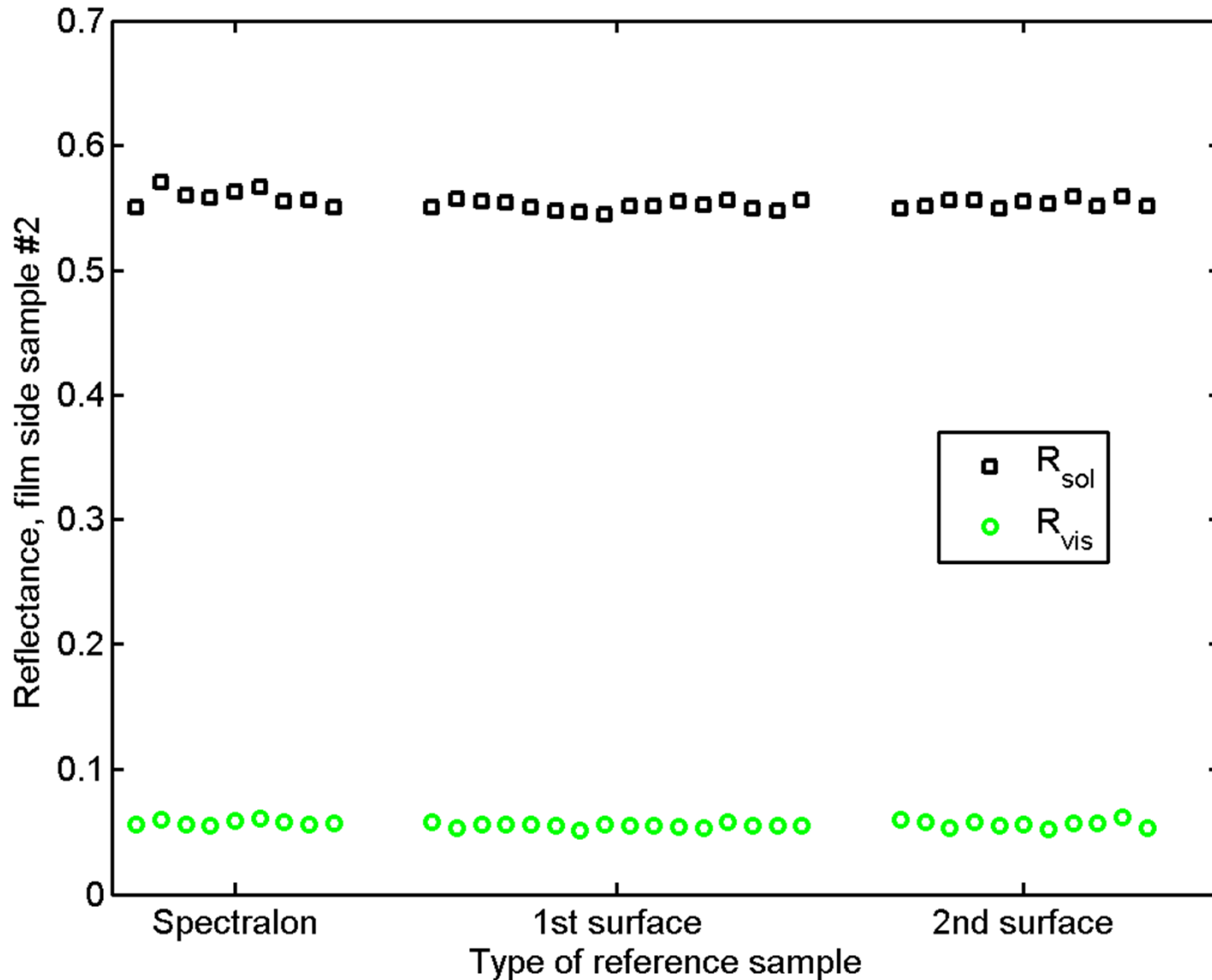
- NIR absorption from spectralon still present for some submitters, better than in 2007
- Applied films interference fringes not appropriately resolved with 50 nm steps.
- Step at grating change

Metal film have absorption matching spectralon bands

- Theory: The detector response is not identical (enough) for reference sample and specular port
 - Use specular reference sample (from OMT !)

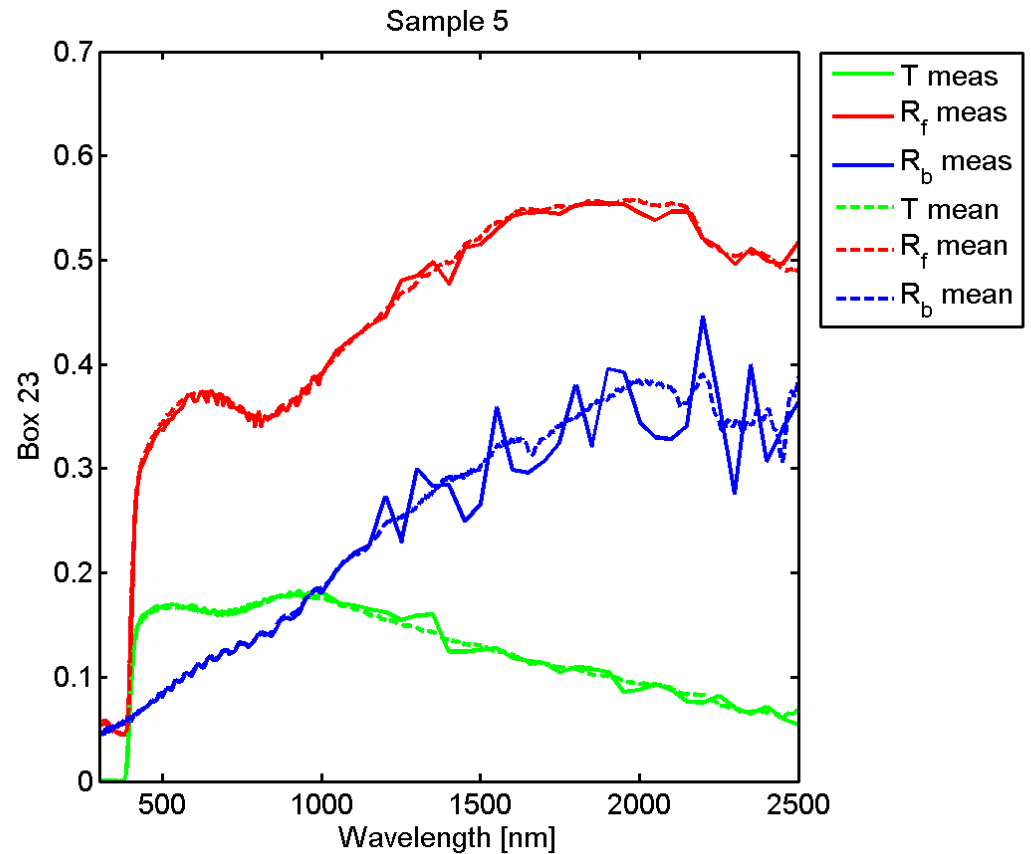


Why not force everyone to use specular reference samples



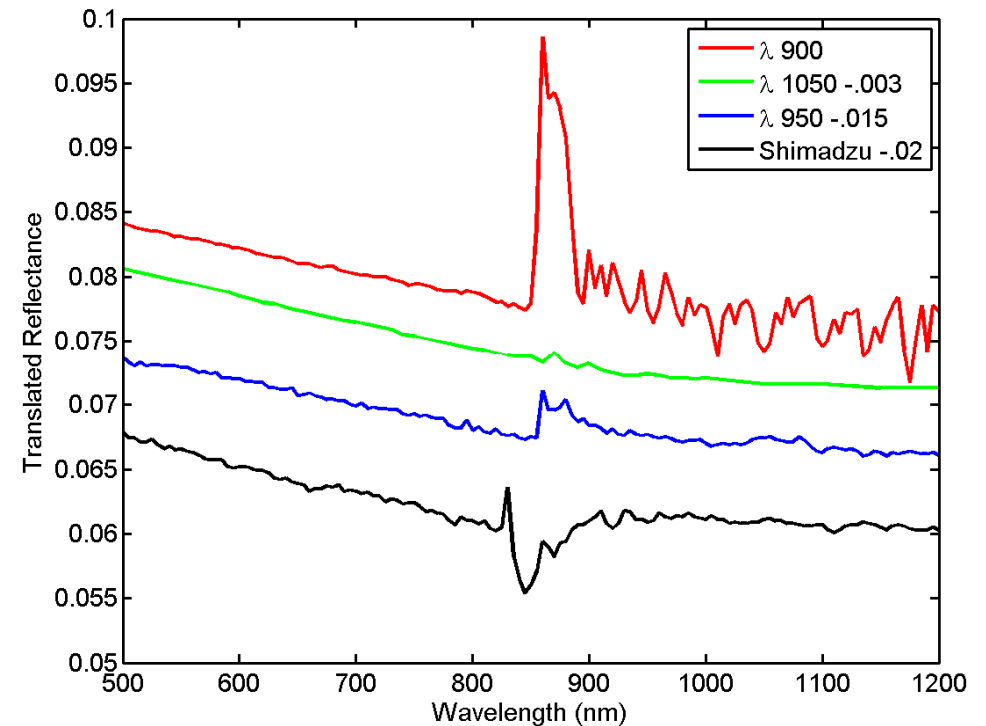
Interference fringes

- IGDB rules allow submissions with 50 nm interval, inappropriate for applied films and thick coatings
 - Update rules



Discontinuity at grating change

- Not physical, multiple theories
 - Grating mismatch
 - Fix slit widths
 - Polarization effects
 - Depolarizer
 - Beam misalignment
 - Zero level measurement



Discontinuity at grating change - Fixed

