

WP3 - Fluorescence



*xDReflect 6th progress meeting
22.6.2016 Turin, Italy*

Contents



- **Objectives of WP3**
- Highlights of WP3 in MIKES:
 - Comparison measurements of fluorescence
 - (more) Lambertian sample (than PTFE)
 - Translucency

Objectives of WP3



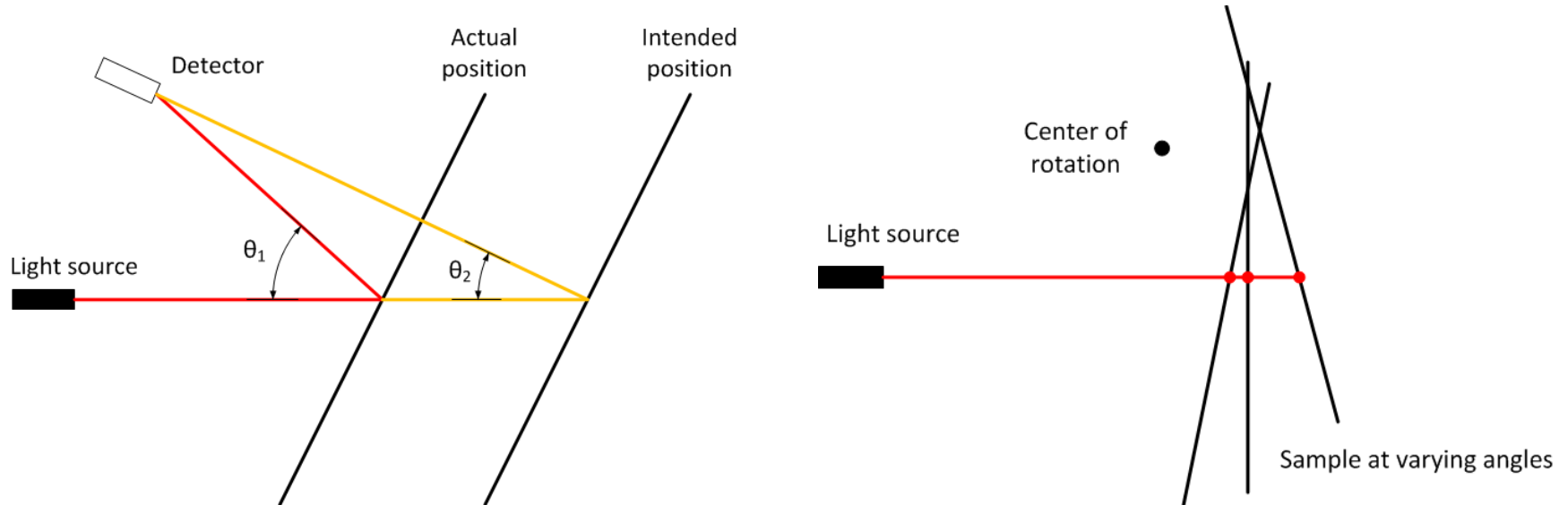
Establishing traceable facilities, methods and reference materials to improve the accuracies of appearance measurements of fluorescent surfaces.

- Improve procedures at NMIs
- Comparison measurements
- Characterizing new samples

WP3 tasks



- 3.1 Developing tools and techniques to improve the accuracy of illumination/observation angles



WP3 tasks



- 3.2 Validation and traceability of facilities for surface fluorescence standards
 - *Interlaboratory comparison for measurement of luminescent and reflected spectral radiance factors between MIKES, CSIC and UA*



S200, S205, S210, S336 and S461.

WP3 tasks



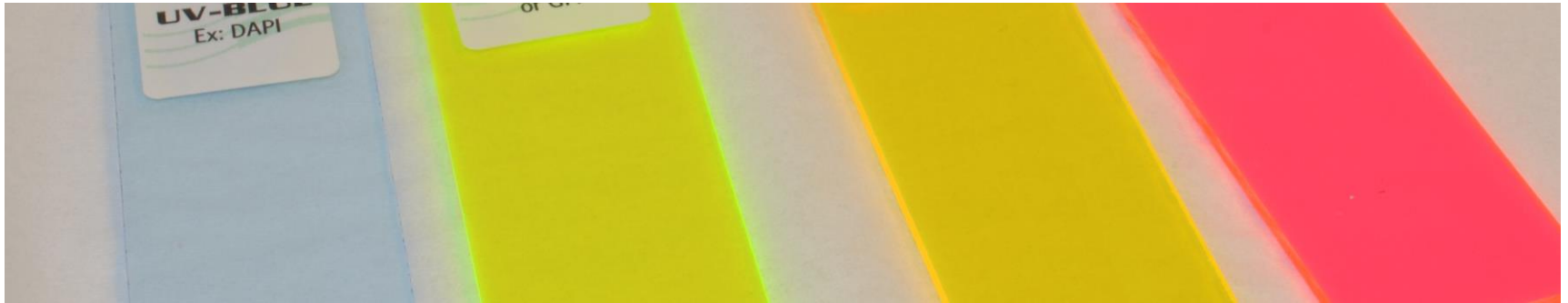
- 3.3 Assessment of (new) fluorescent diffuse reflectance standard materials
 - *selecting 10 samples*
 - *characterizing their angular and spectral characteristics*



WP3 tasks



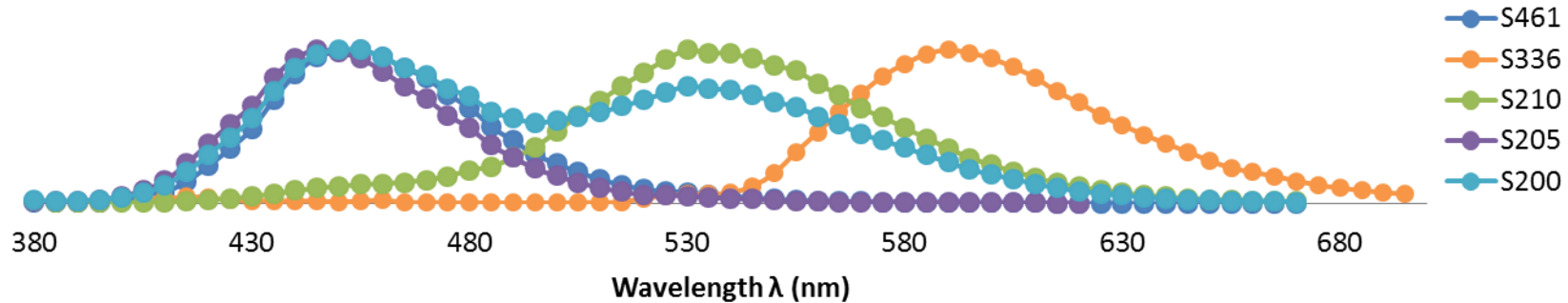
- 3.4 Combined effect of translucency, gloss, and fluorescence in standard artefacts
 - *Samples with variable thicknesses made of standard UV activated diffuser materials selected and characterized for spectral transmission and gloss*



WP3 tasks



- 3.5 Need for fluorescent colour standards for the 'gaps' in gamut
 - *Investigating the color gamut of commercially available fluorescent standards and identifying gaps*
 - *Deliverables: reports, data*



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Comparison measurements



Goniometrical measurements of
bispectral luminescent radiance factors –
MIKES, CSIC, UA

Spectralon USFS series standard samples



S200, S205, S210, S336 and S461.

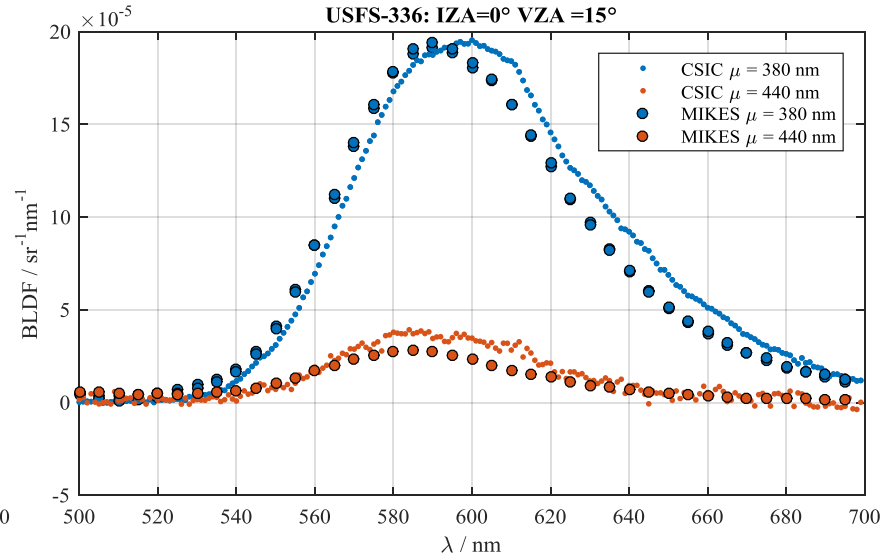
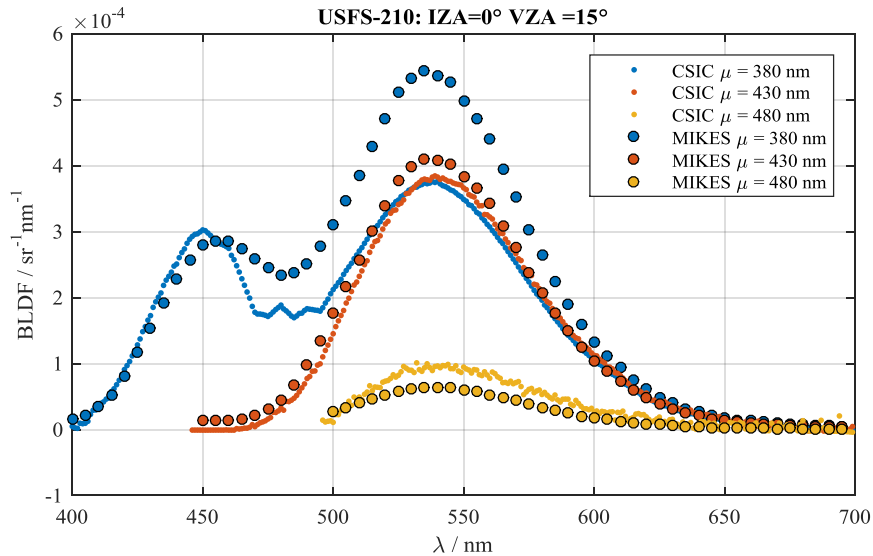
Comparison measurements



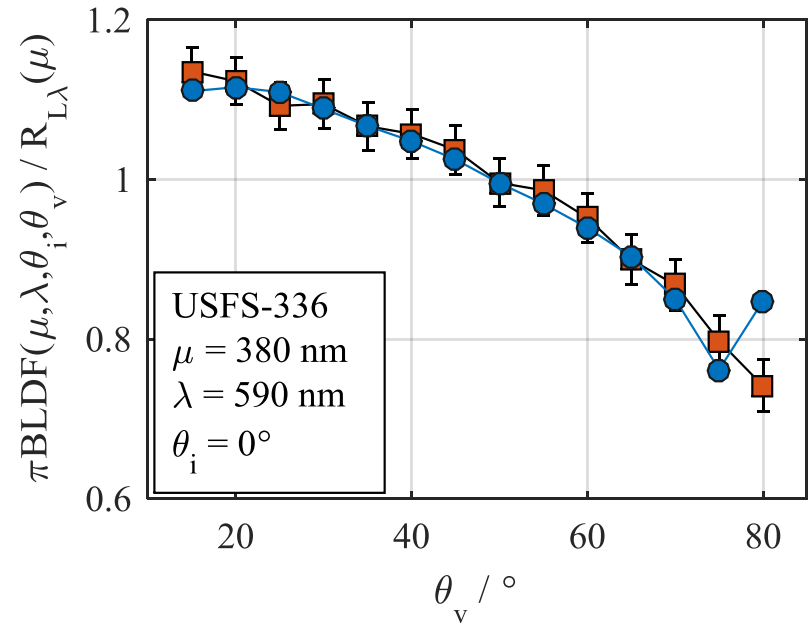
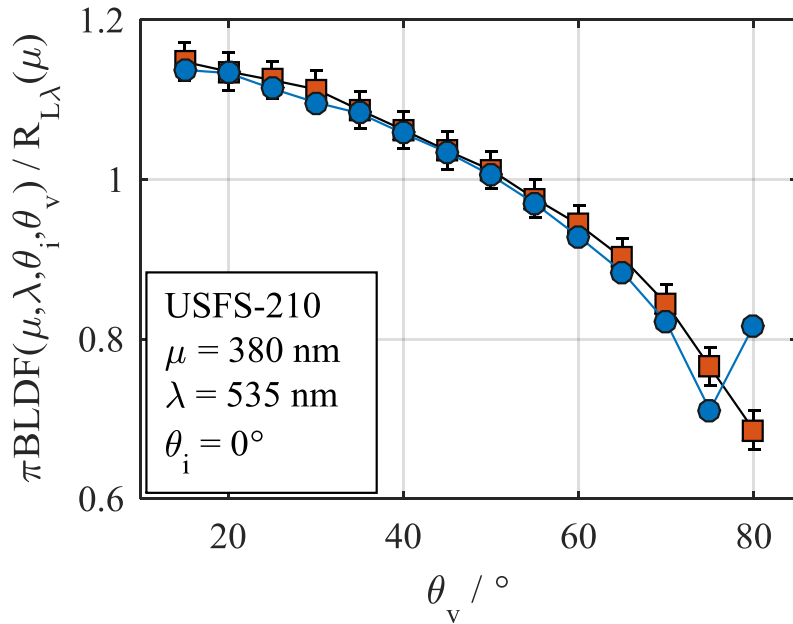
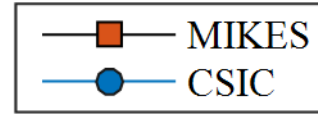
Benefits of the comparison:

- **Improvements of the setup in MIKES:**
 - *Stray light correction*
 - *CCD response uniformity*
 - *CCD linearity characterization*
 - *Dispersion of the emission grating*
- **Improvements in the data processing in CSIC**

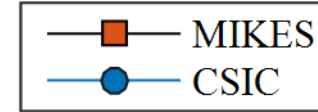
Comparison absolute spectral



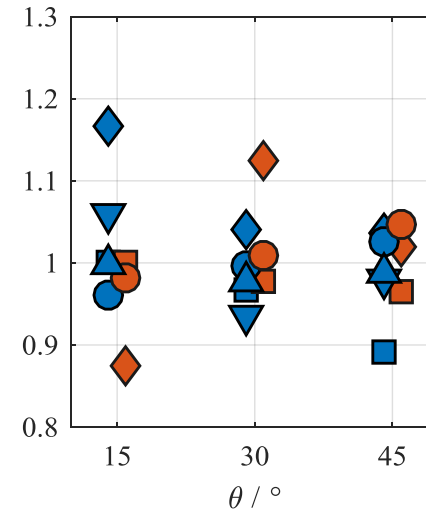
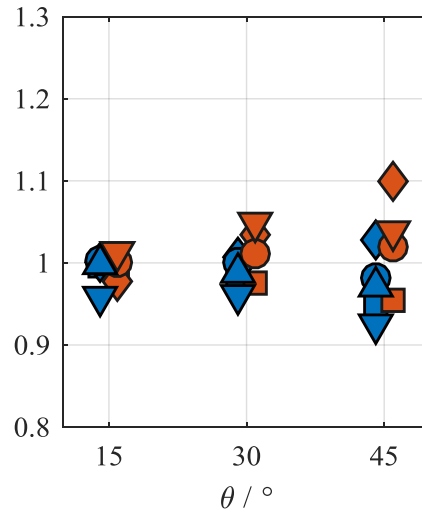
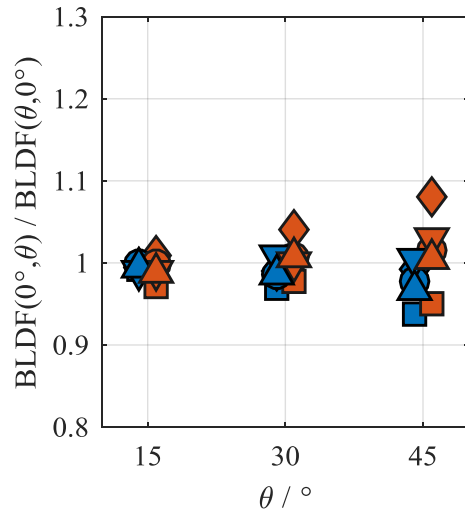
Comparison angular



Comparison reciprocity



Exc. wl. short medium long



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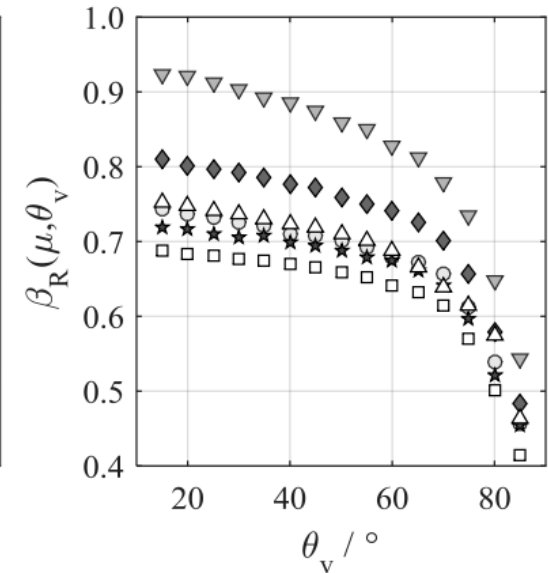
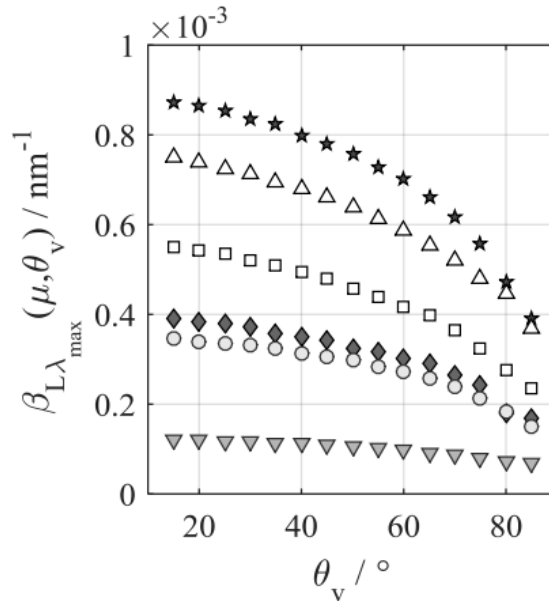
Non Lambertian emission



PTFE based standards:

- Emission:
non Lambertian
- Reflectance:
non Lambertian

Volume effects



Non Lambertian emission



Why do we care?

- **Measurement errors with fixed geometry instruments.**
 - Different geometries

Non Lambertian emission

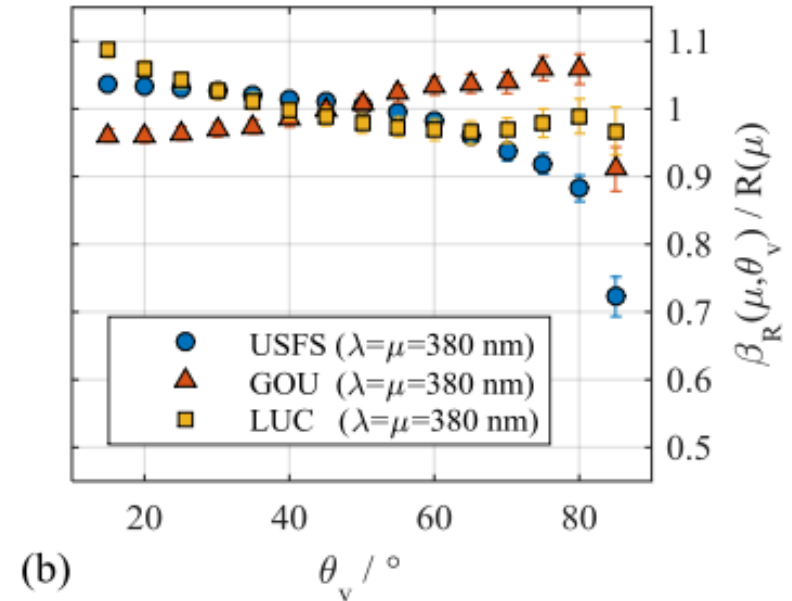
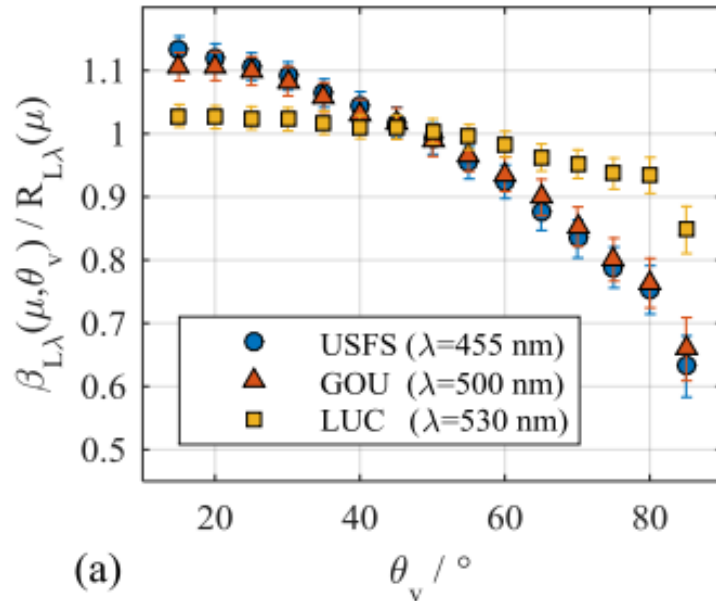


Ceramic tile coated with a thin layer of fluorescent material by Lucideon.

Layer 0.18 mm (0.03 mm)



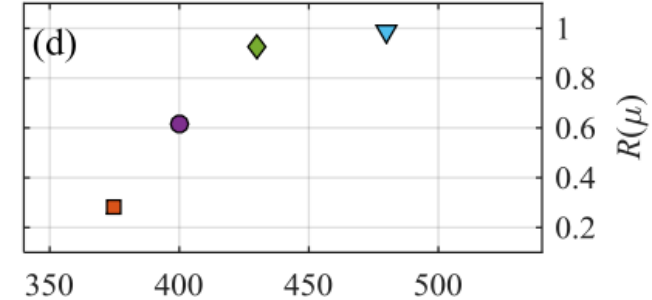
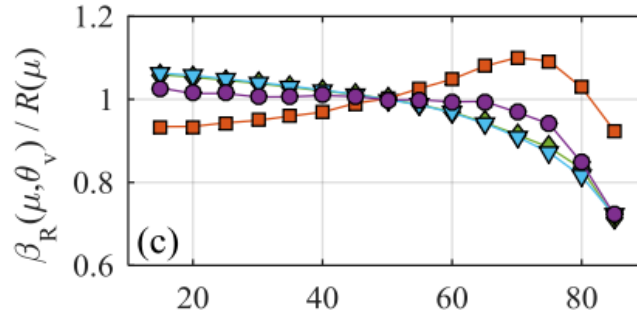
Emission and reflectance profiles



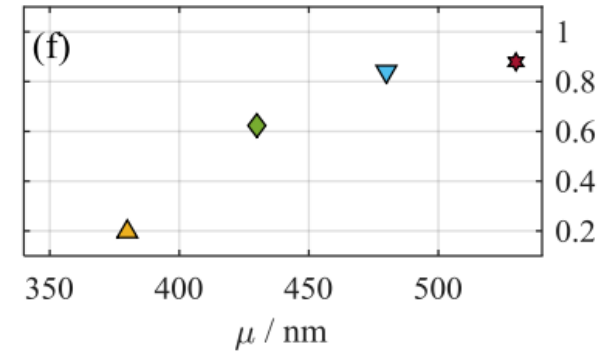
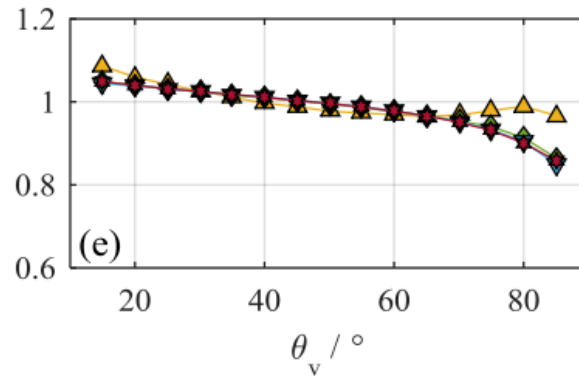
Angular reflectance profiles depend on absorbance



PTFE: GOU



Ceramic: LUC



Absorbance dependent reflectance profiles



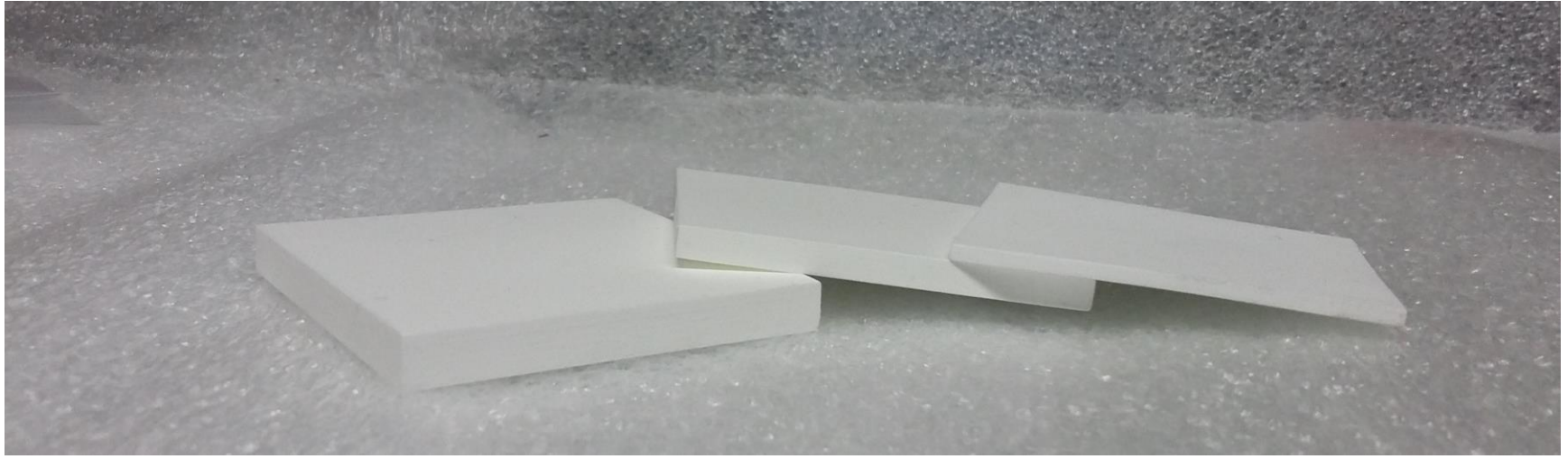
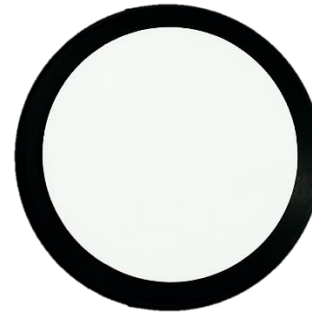
- **Large spectral differences in the angular reflectance profiles**
 - Measurement errors if unaccounted for.
 - Goniochromatic effects, if the absorption of the fluorophore is in the visible range.

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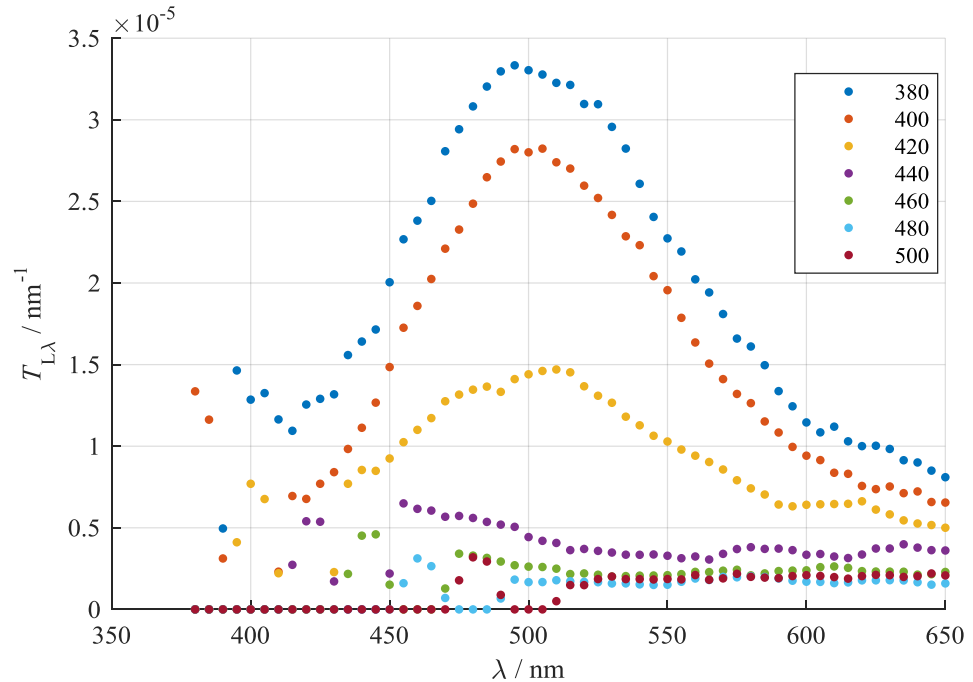
Translucency



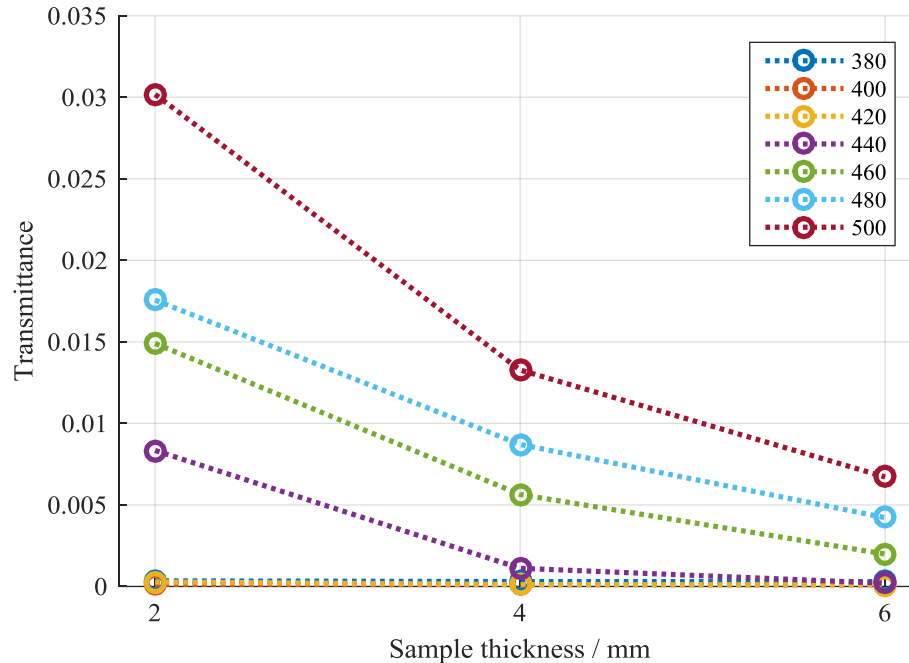
Transmitted fluorescence emission



100 x less than
In reflectance mode



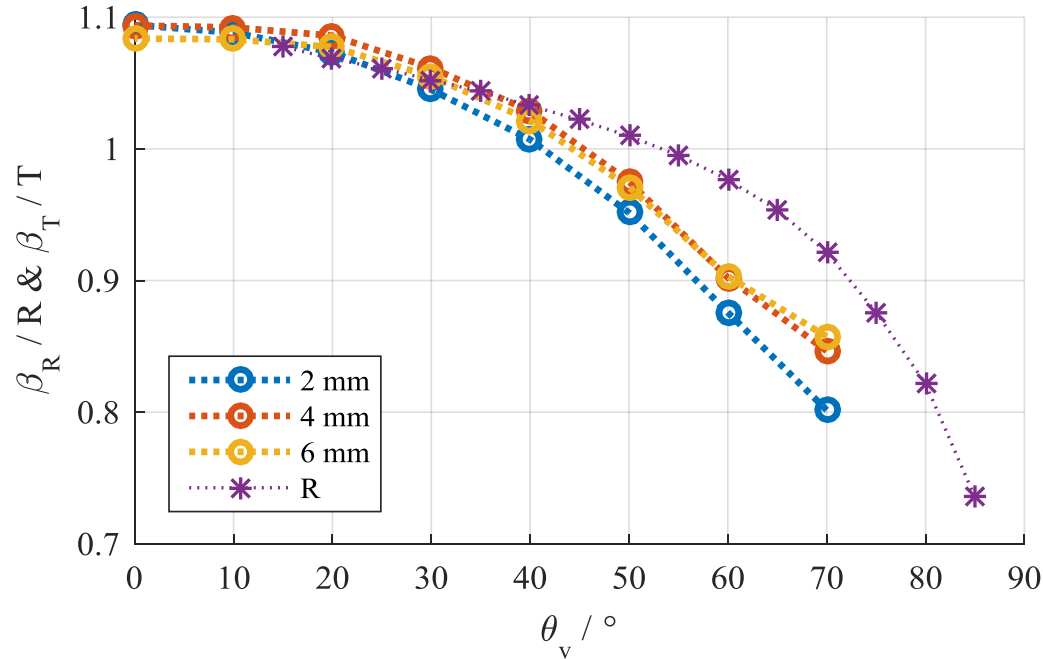
Transmittance at excitation wavelength



Effects on:

- Quantum yield measurements

Transmittance angular profiles



Conclusions



- **Comparison measurements have helped to improve the setups and procedures**
- **A sample with more Lambertian angular emission and reflectance profiles made available now.**
- **Discovery: absorbance dependent reflectance profiles**
- **PTFE samples translucent: up to 3% of incident light passes through a 2 mm sample.**

Thank you!



Thank you for your attention!

Thank you for your input to the WP3!