Fogra

Converting instrument readings into visual plausible colour measurements

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Agenda

1. Fogra - Exploring | Testing | Certifying
2. Colour measurement could be so easy
3. But, practically …
4. Summa

1. Fogra - Exploring | Testing | Certifying

Fogra -
Serving the print industry for over 60 years

Applied Research	**Expert opinions**
Testing & Certifications	**Standardisation**

1. Fogra - Exploring | Testing | Certifying

Building setups for measuring fluorescing inks


München, September 2017
Fogra-Forschungsbericht 80.008

Grundlagen der grafischen Standardisierung bei der Herstellung von Kunststoffkarten

Johannes Bartl
Uwe Bertholdt
Arne Müller

1. Fogra - Exploring | Testing | Certifying

Providing basis for managing transparent media


Fogra

München, Mai 2017
Fogra-Forschungsbericht 10.060

Farbmanagement für
Transparente Medien

Berthold Oberhollenzer
Roman Byshko
Andreas Kraushaar
Philipp Tröster

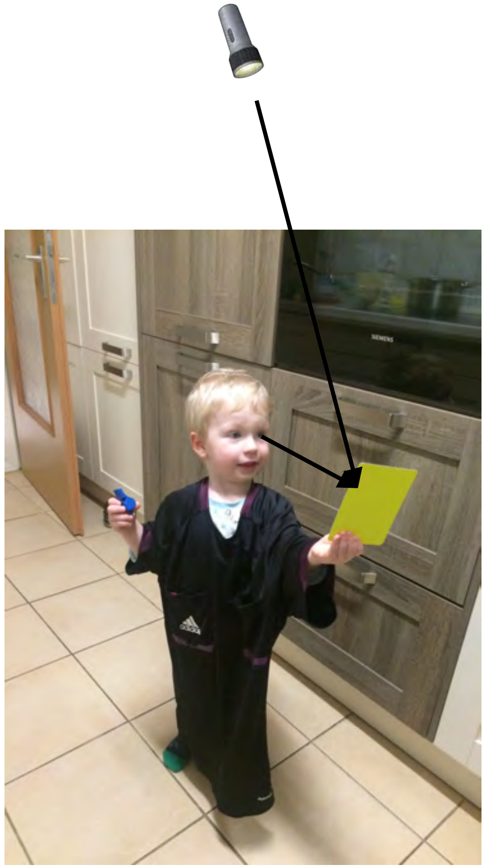
2. Colour measurements could be so easy

Make sure that you:

Measure as you see!

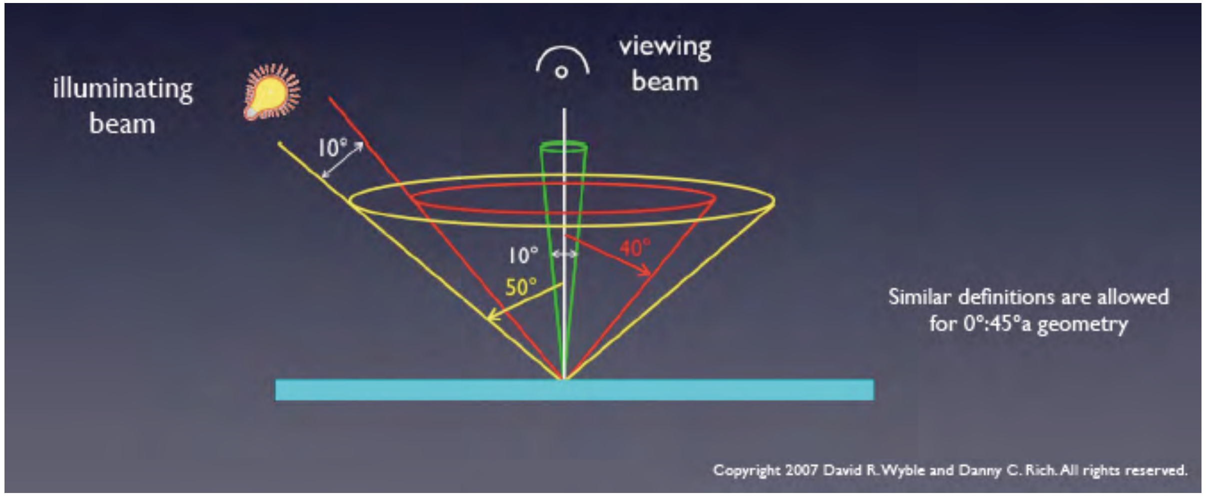
2. Standardized geometries work fine

And the best average for actual viewing is (some sort of) directional illumination and (glare free) viewing under 45° ➡️ 45°/0°



2. Standardized geometries work fine

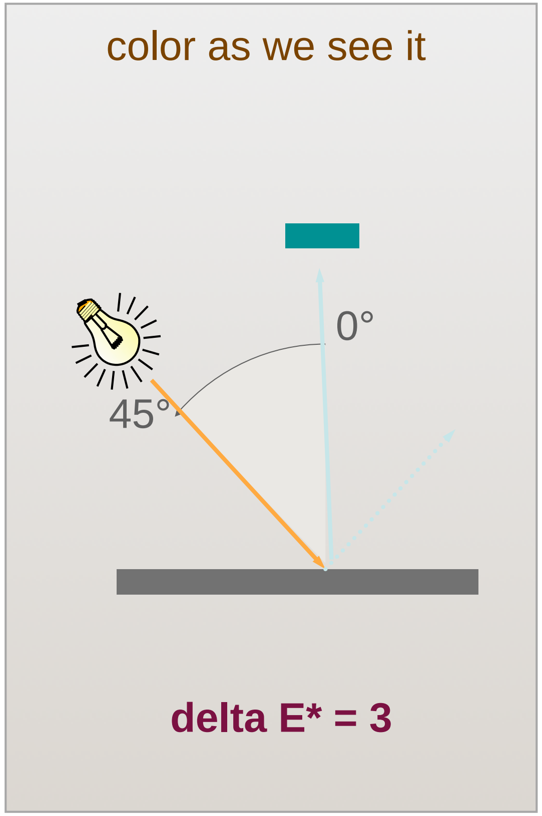
Geometry	Old	New	Definition
bidirectional	45/0	45°x:0°	incident at a single azimuth angle
		45°c:0°	circumferential (partial annular)
		45°a:0°	annular illumination
hemispherical	d/0	di:8°	diffuse illumination, specular included, 8° detection
		de:8°	diffuse illumination, specular excluded, 8° detection
		d:0°	used only when detection is at the normal



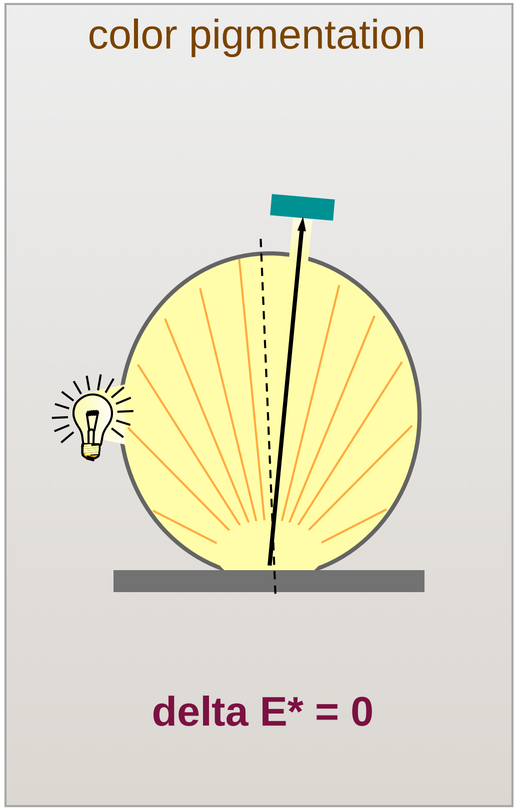
for objects that reflect „normally“ (no lateral diffusion), but with the need for small apertures (no real estate on the prints for control elements …)

2. Take care what to measure

45°x:0°

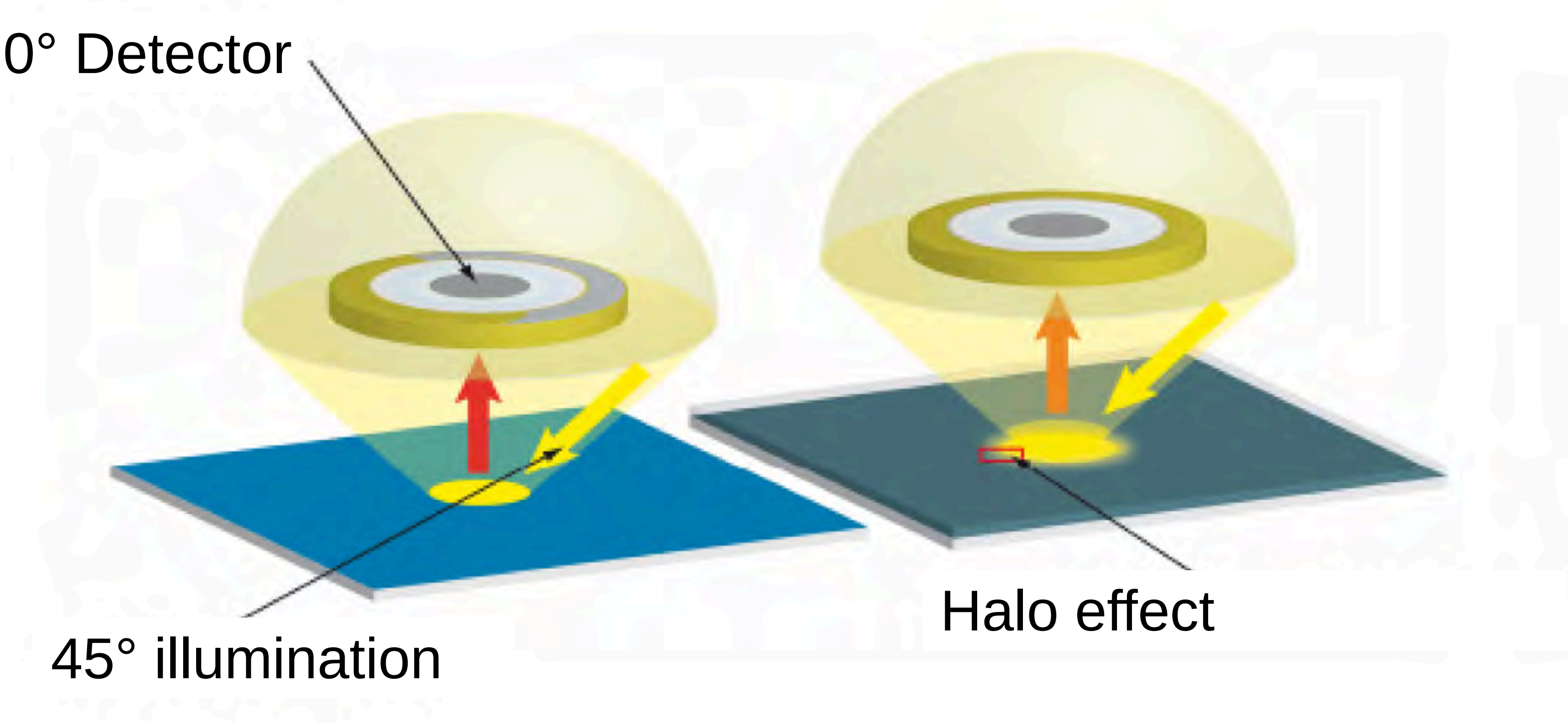


di:8°



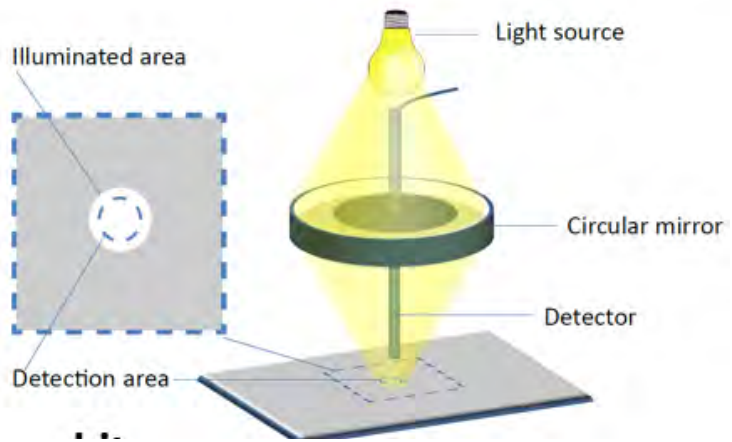
* Specular Included

2. as long as samples are not translucent



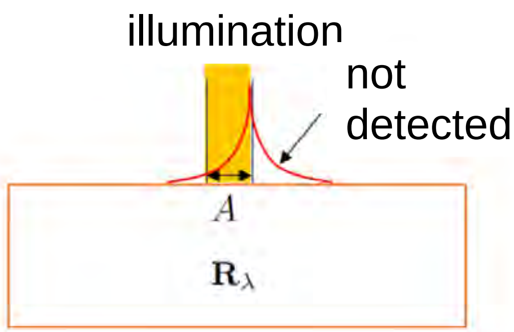
effect called:
¬translucent blurring
¬lateral diffusion
¬subsurface scattering

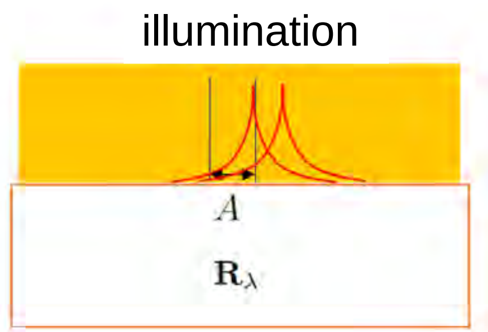
2. ISO 13655 defines over- and underfilling



ISO 13655:2017 cites ISO 5-4 and requires:
“the realised boundary of the larger of the illuminator region and the receiver region shall be outside the boundary of the smaller by at least 2 mm.“ & opaque reference materials.

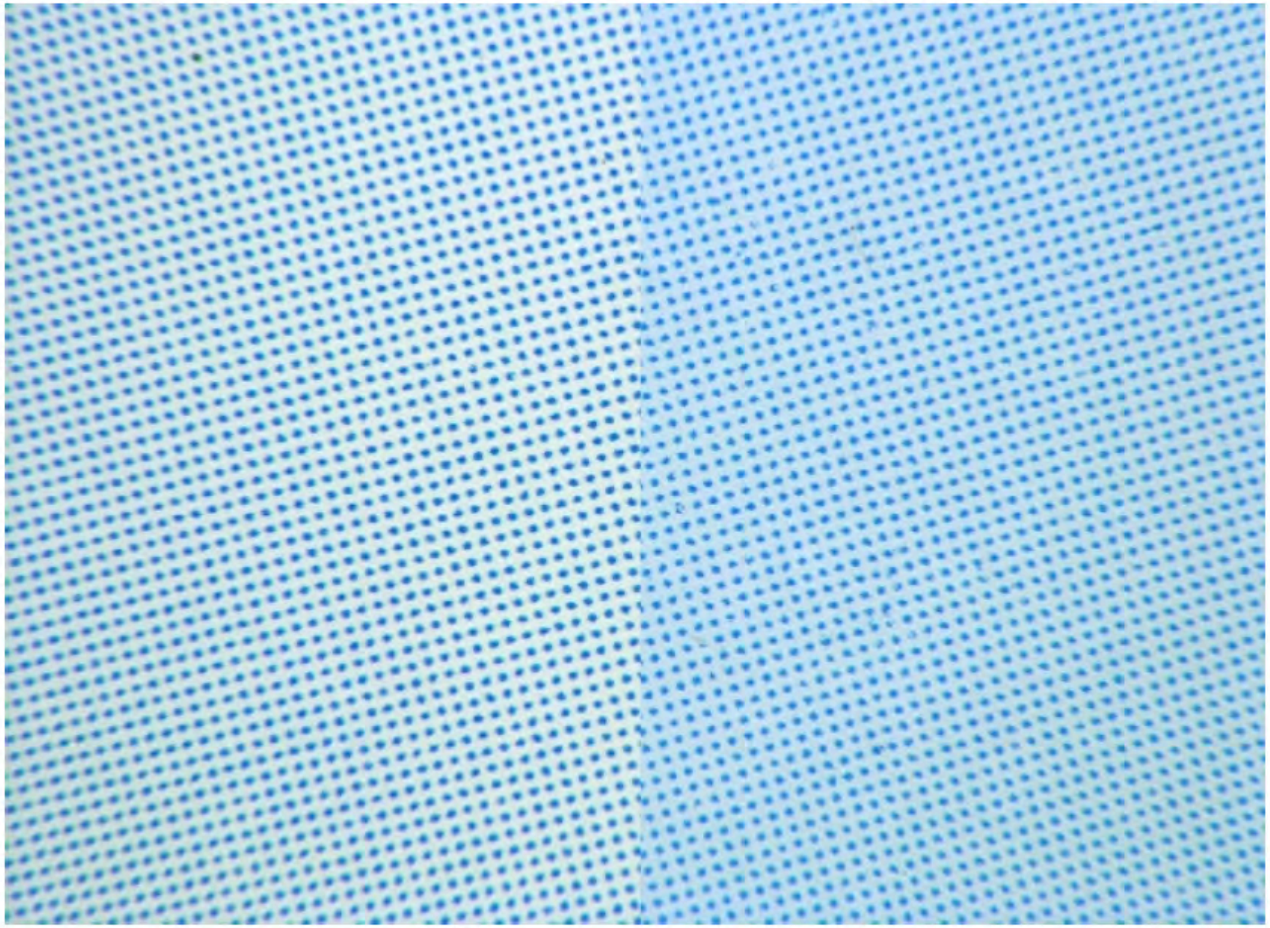
non plausible colour values





3. Some materials show lateral diffusion

60x magnified halftone on Polycarbonat

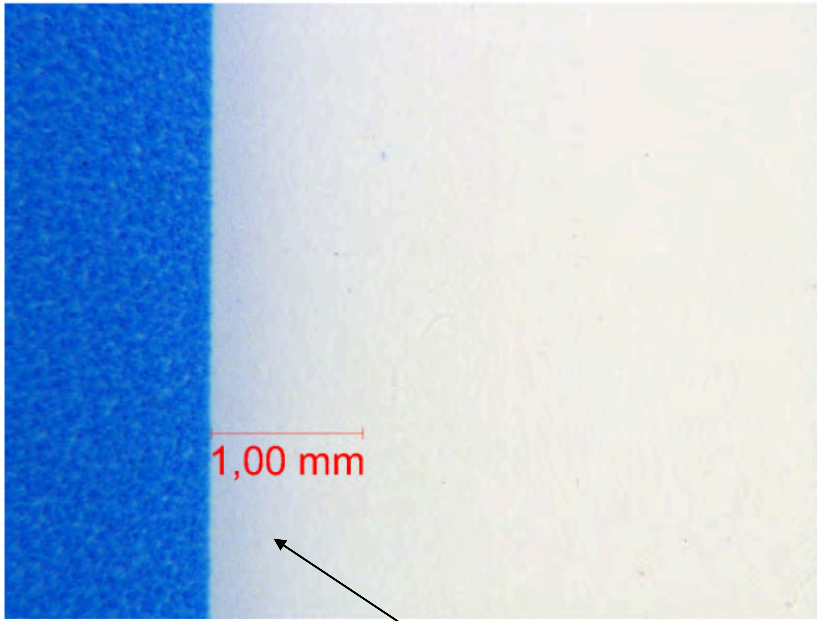


No lamination

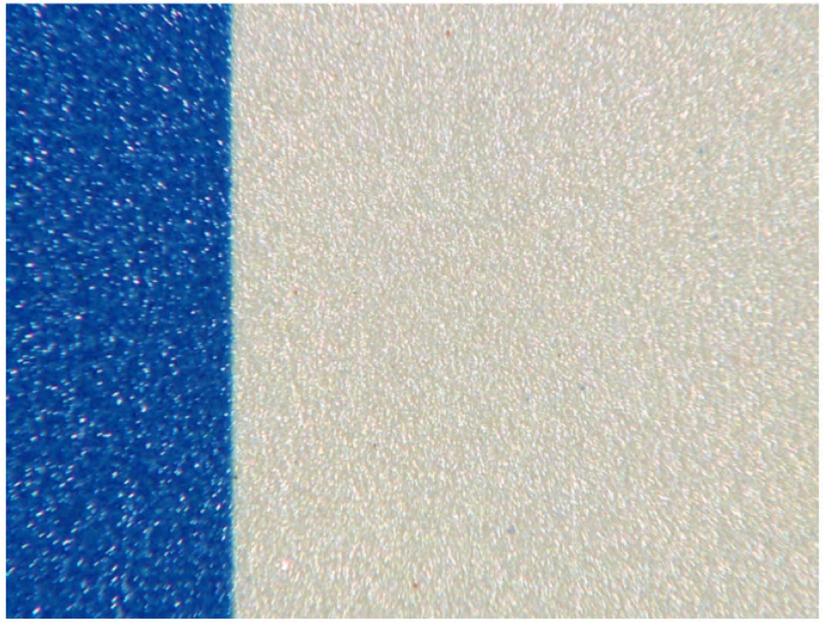
200 µm think Polycarbonat-Overlay film

3. Some materials show lateral diffusion

60x magnified solid on Polycarbonat



200 µm think Polycarbonat-overlay film



No lamination

Blue shadow …

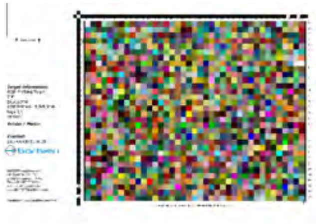
3. Also for 3D printing materials …

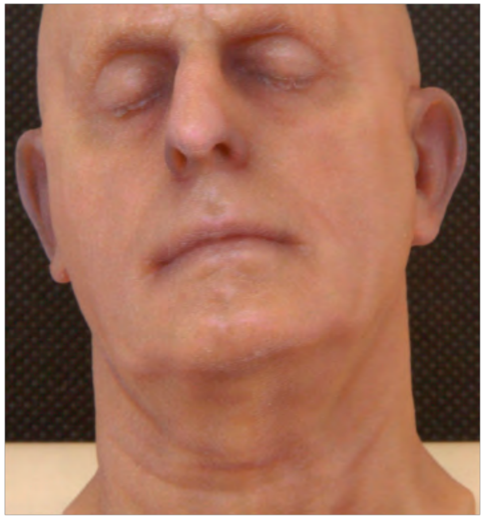
pulver and polyjet printing,

which require even more overfilling

3D softproof requires

- colour beside 45°/0° (BRDF)
- translucency assessment





http://cappsit.s3cloud.de

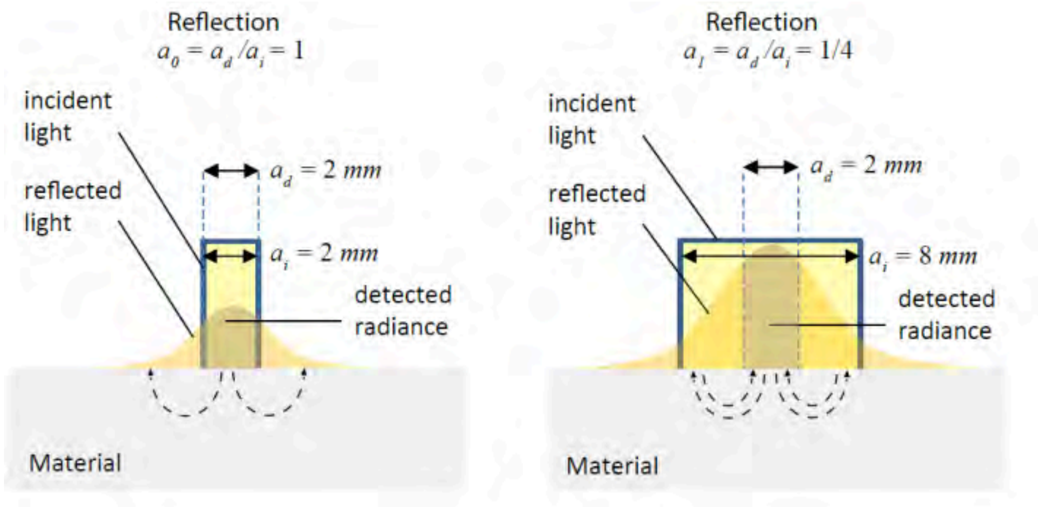
3. Proposing a method to measure „halo“

Method „edge loss measurement“ proposed:

based on:

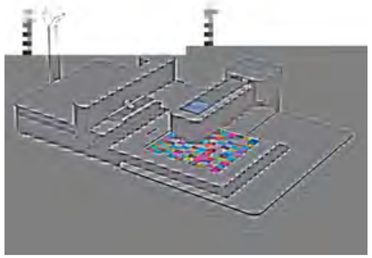

Fraunhofer IGD
zbs
Fogra

Prozessstandardisierung
im grafischen 3D-Druck
für 3DP- und FDM-Verfahren

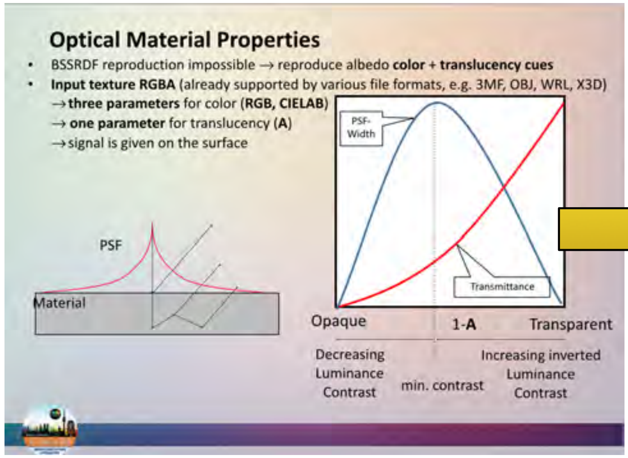


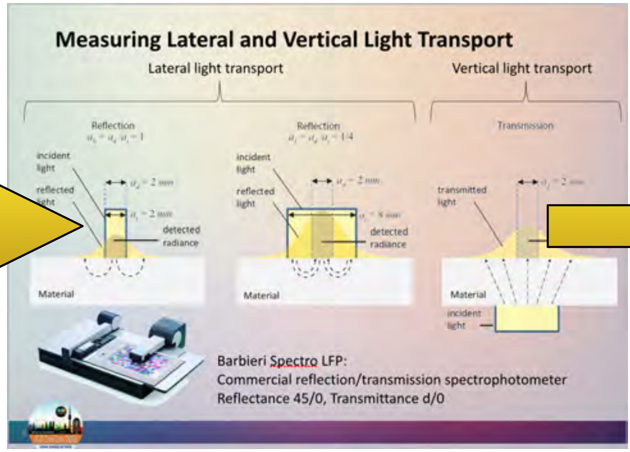
2 mm illumination

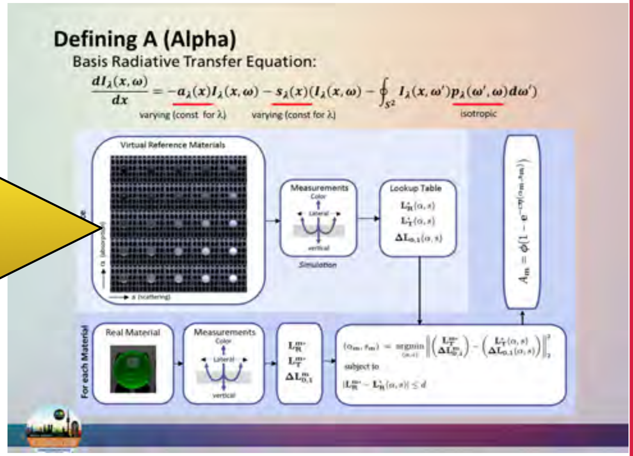
8 mm illumination

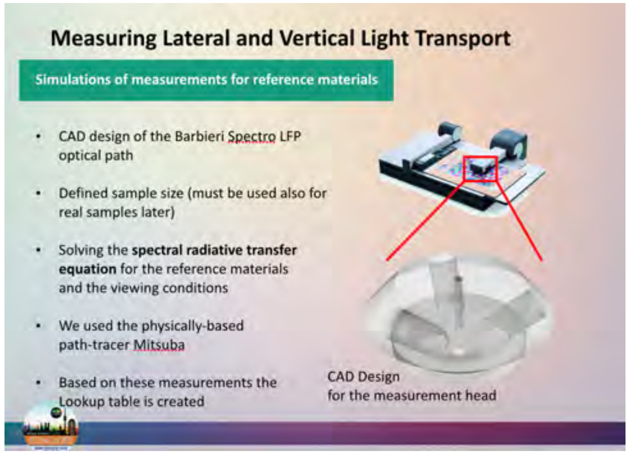


3. Metric details










Redefining A in RGBA: Towards a Standard for Graphical 3D Printing

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1. INTRODUCTION

Paper, Data and Matlab- / Mitsuba-Code is Publically Available:

https://arxiv.org/abs/1710.00546

4. Take Home Message

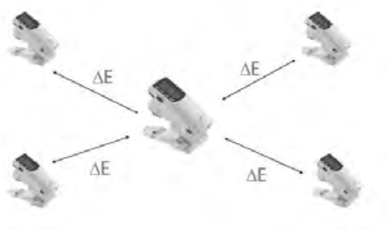
- Since we print on anything which is not running away, there are more materials to come
  - plastics of all sort (including 3D prints)
  - ceramics
  - textiles
  - and many more
- Check your samples to be measured for visual plausibility

  ➡️ PSD Practical plausibility check
- Make a measurement as planed
- View that CIELAB value in Photoshop
- Proof that colour by means of a ISO 12647-7 conforming proofing setup
- Compare the sample with the rendering

4. Summary

- Question all colour measurements
- Samples with no or less translucency can be measured as expected with 45°/0° geometry
- Use integrating sphere devices for matching physical objects (no appearance)
- Try to establish an uncertainty budget and judge your tolerances afterwards

Why not smaller tolerances?



Inter-Instrument agreement

Inter-model agreement

Intra-model agreement

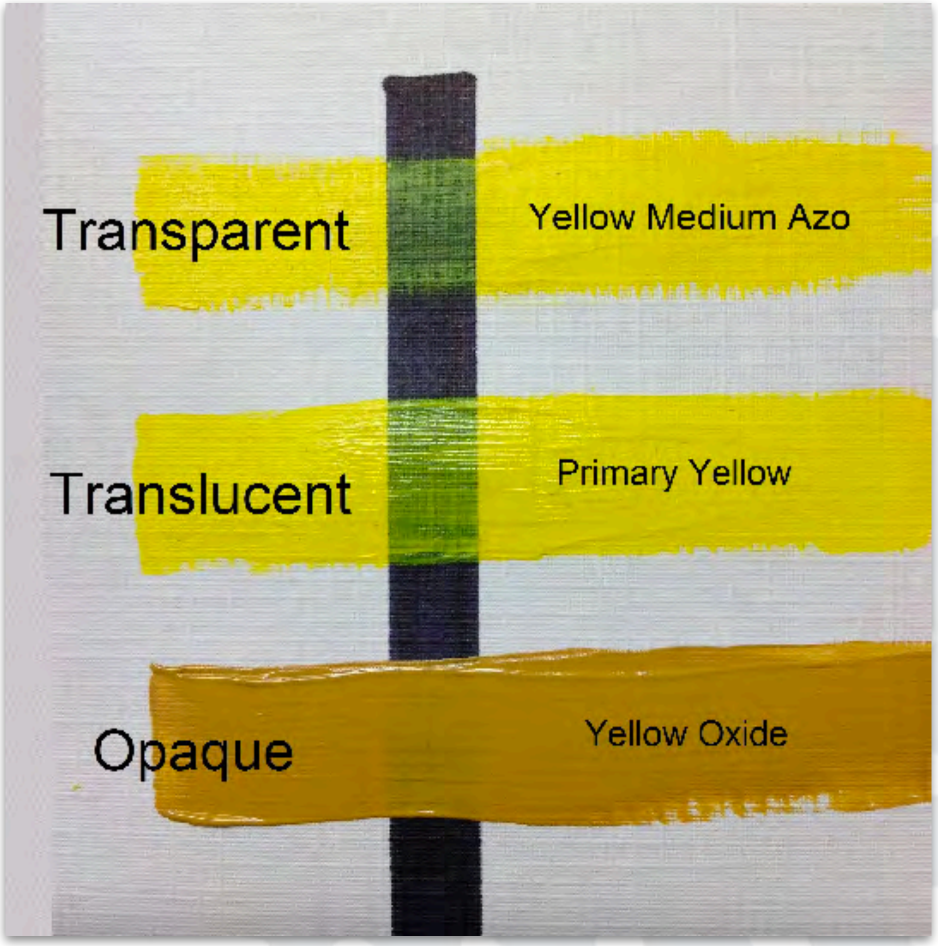
- Consult available guidance:
  - Technical report to come: „Assessment and validation of the performance of spectrocolorimeters and spectrodensitometers“
  - Fogra PSD handbook

5. Resume

„When you can measure what you are speaking about and express it in numbers, you know something about it"

Lord W. T. Kelvin, Lecture to the Institution of Civil engineers, London, 3 May 1883

Backup



translucency, *n*—the property of a specimen by which it transmits light diffusely without permitting a clear view of objects beyond the specimen and not in contact with it.

translucent, *adj*—transmitting light diffusely, but not permitting a clear view of objects beyond the specimen and not in contact with it.

transparency, *n—(1)* the degree of regular transmission, thus the property of a material by which objects may be seen clearly through a sheet of it.

transparent, *adj*—transmitting radiant energy without diffusion. (1990)

haze, *n—in transmission,*
(*1*) the scattering of light by a specimen responsible for the apparent reduction in contrast of objects viewed through it. **(D1003)**
(*2*) the percent of transmitted light that is scattered so that its direction deviates more than a specified angle from the direction of the incident beam. **(D883, D1003)**