

Practical problems in testing digital cameras

Christian Loebich

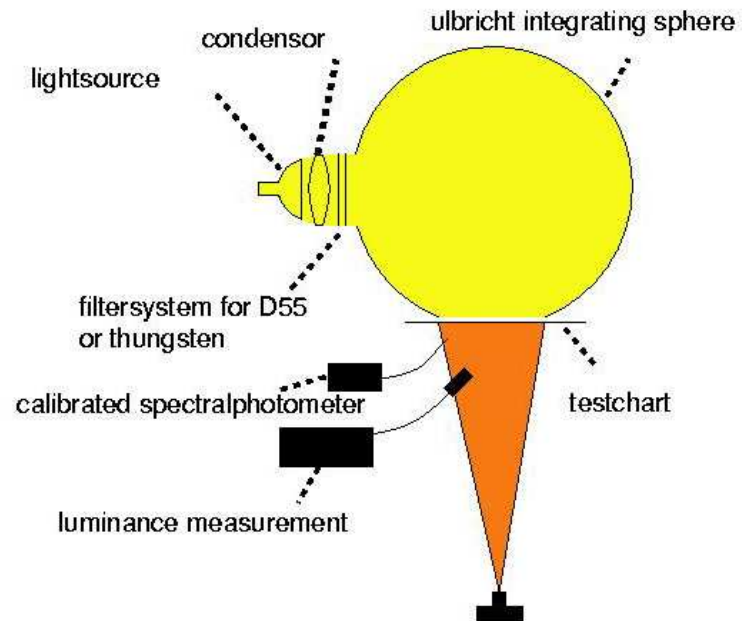
Anders Uschold

Introduction

- Characteristic curve (OECF)
- White balance
- Noise measurement and new noise smoothing algorithms
- Color reproduction
- Resolution measurement

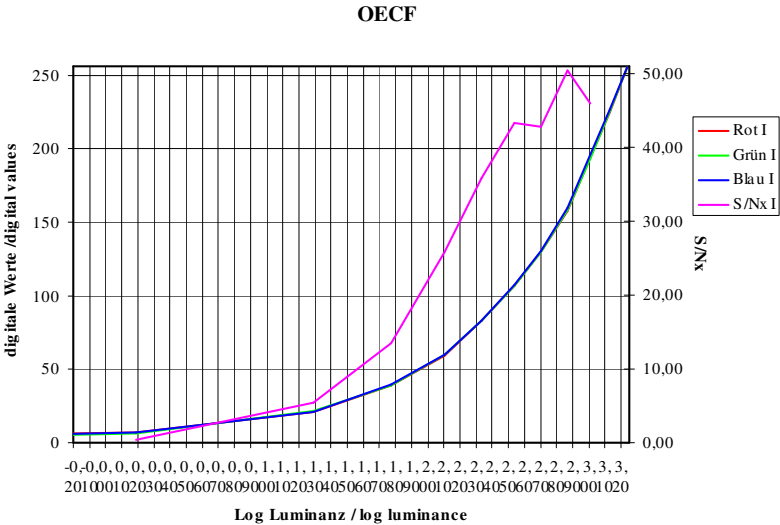
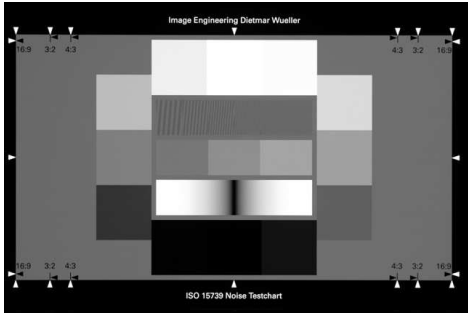
Equipment for testing OECF

- Ulbricht sphere of 1m diameter
- Light source halogen lamps of 3 x 300 W
- Spectral distribution and illumination level are controlled
- Filters for daylight and tungsten conditions



OEFC daylight perfect

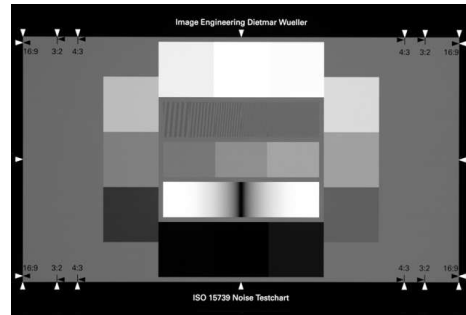
- OEFC daylight perfect
Leica
S1



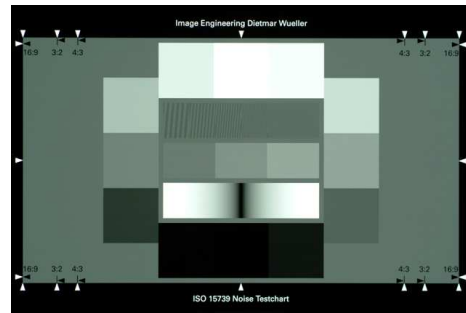
OECF daylight real

- OECF daylight perfect

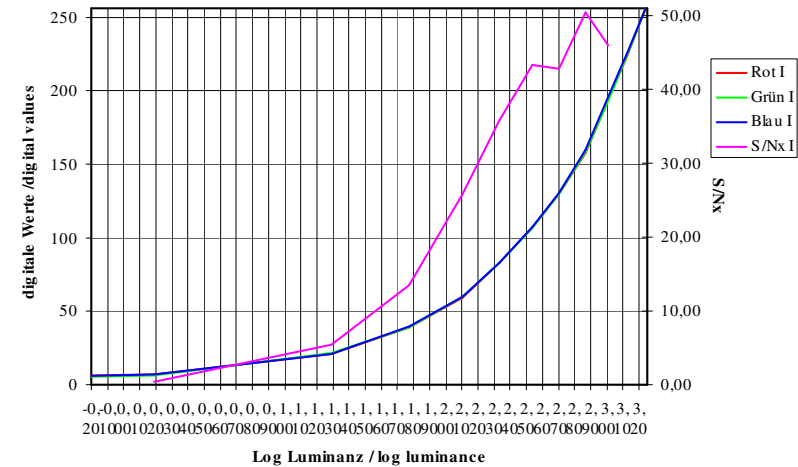
Leica
S1



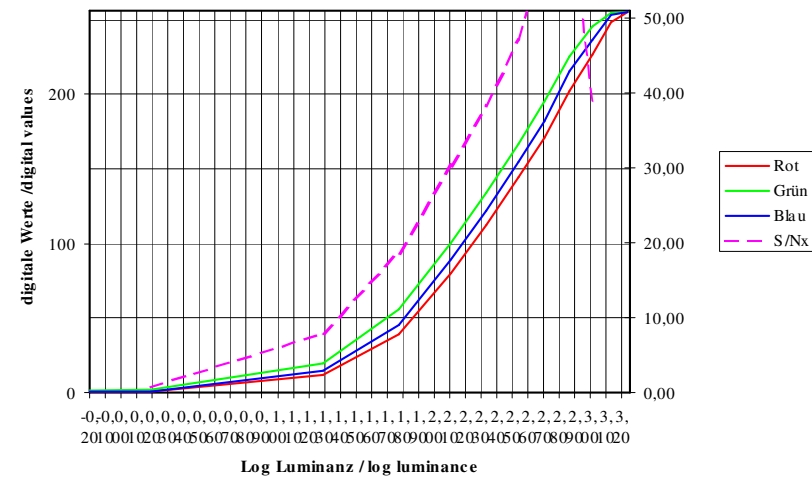
- OECF daylight
Fuji FinePix S2 Pro



OECF

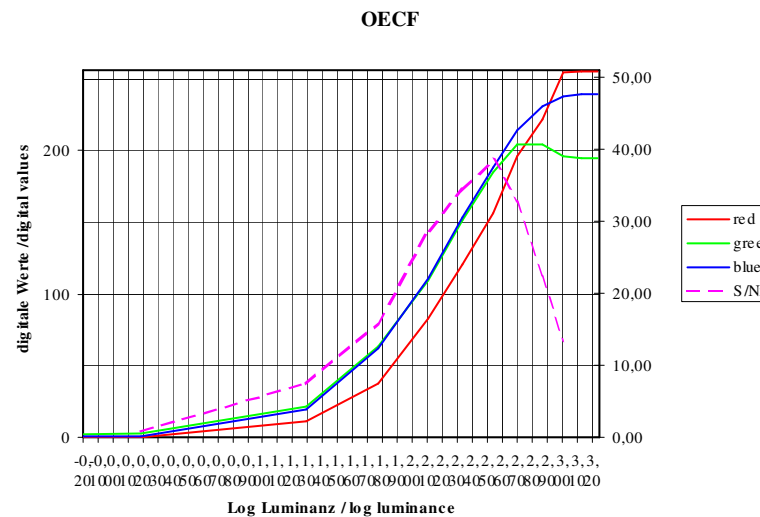
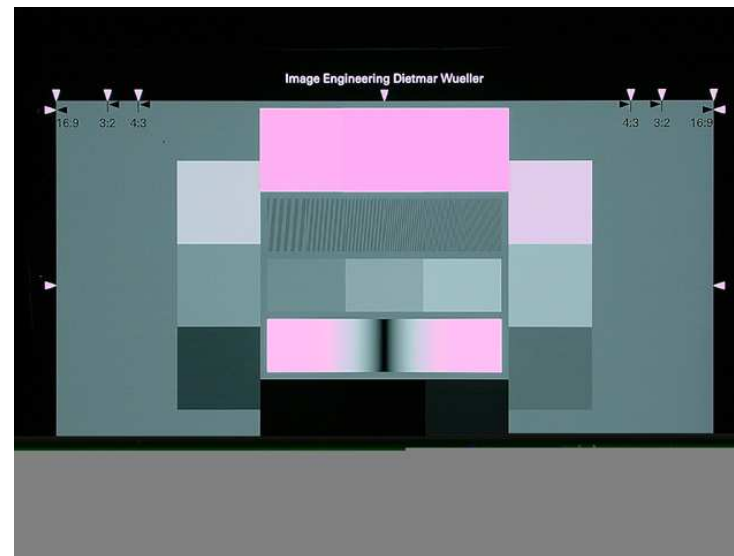


OECF



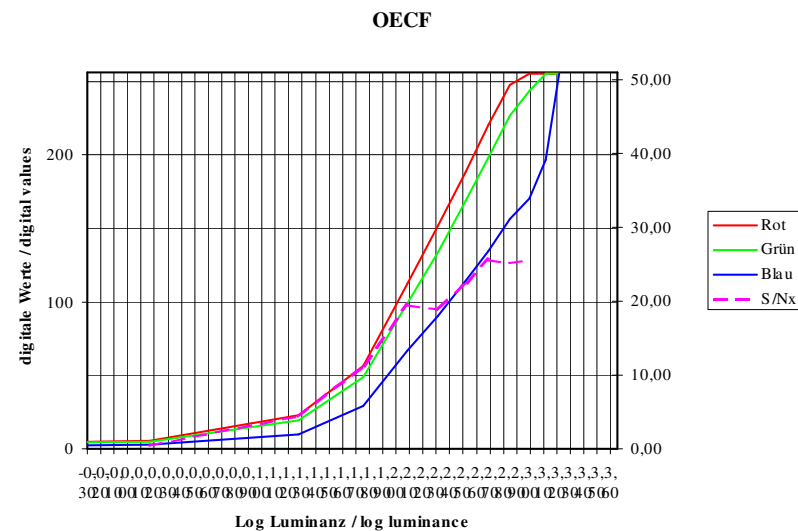
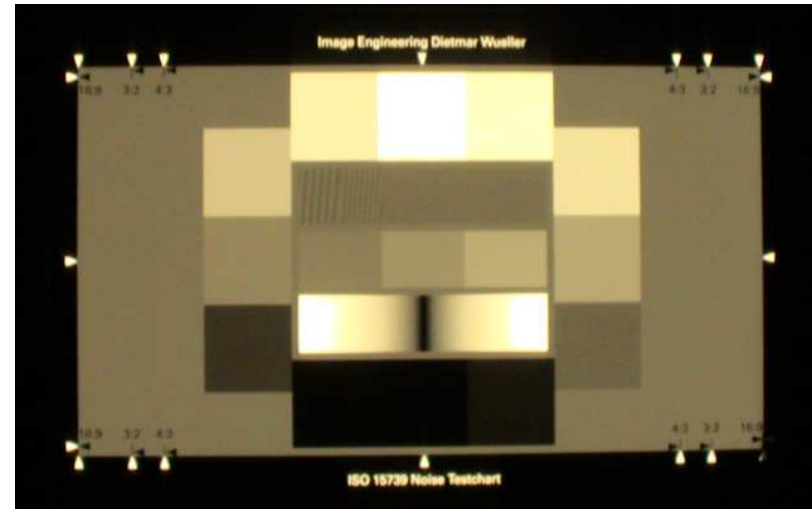
OECF color problems

- Brightest patch should be in saturation level
- Cross curves
- Caused by dynamic range compression algorithms



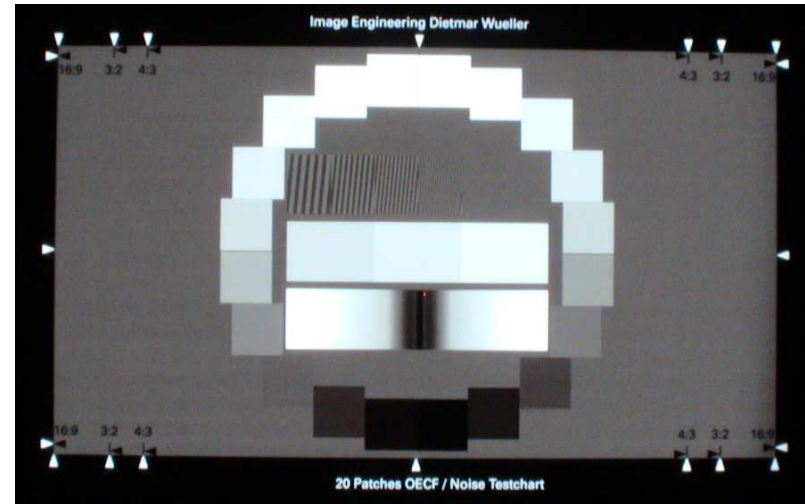
OEFC tungsten

- Tungsten light is difficult
- Keep color cast or total neutralization of the image ?
- Tungsten light in Germany usually bulbs, in Japan more fluorescent light



OECF 20

- Dynamic range of 1:1000 with 12 patches
- Higher dynamic range is difficult to realise
- New chart with 20 patches is leading to a dynamic range of 1:10000
- Disadvantage:
Neutral grey test chart is very difficult to realise



Noise measurements

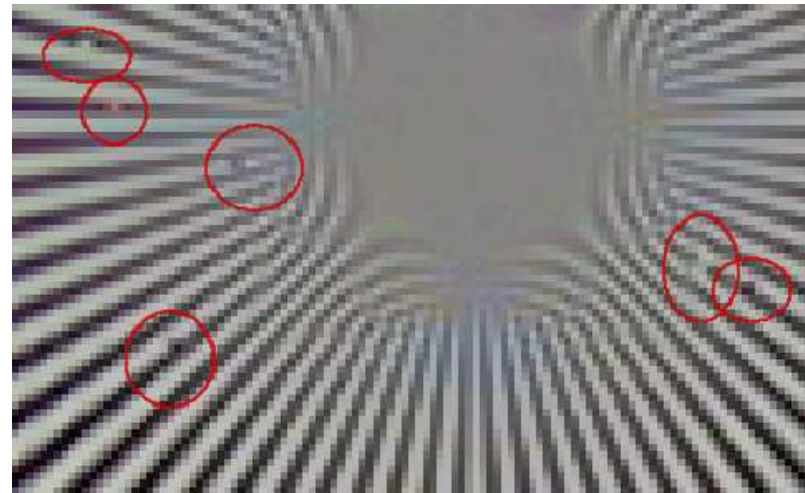
- Low level contrast area
- „Nothing special to see“



Noise measurements

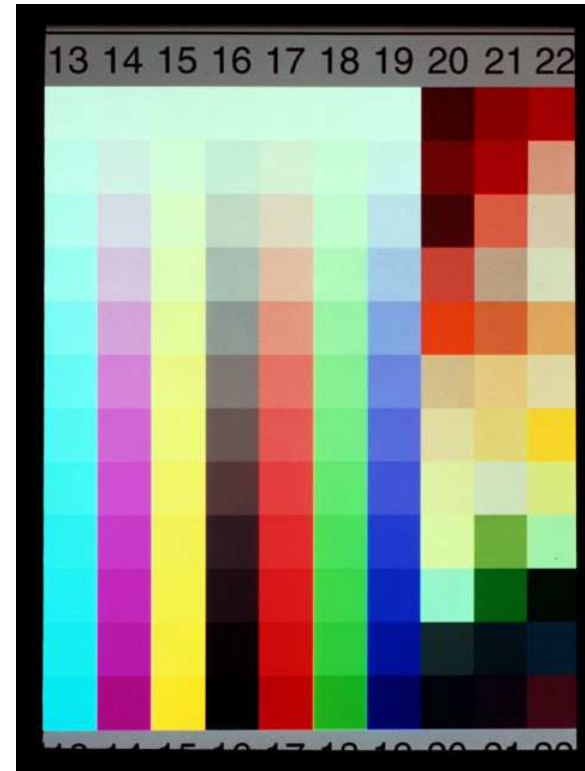
- Low level contrast area
- „Nothing special to see“

- Exactly the same position on the sensor
- High contrast Pattern
- Small spots are dust on the sensor



Color reproduction IT8

- Year 1996
- IT8 transmission chart
- Enlarged on slide film
~ 20 x 30 cm
- Measured with
spectralphotometer
- Disadvantage:
Chromogenic colors
which are not existing
in nature



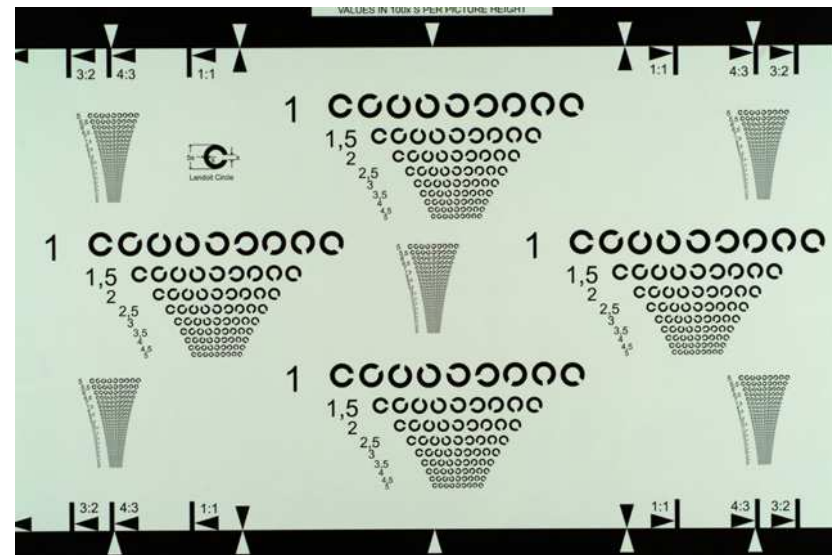
Color reproduction Color Checker DC

- Year 2000
Gretag Macbeth
- More natural colors
- White areas
- White point compensation possible



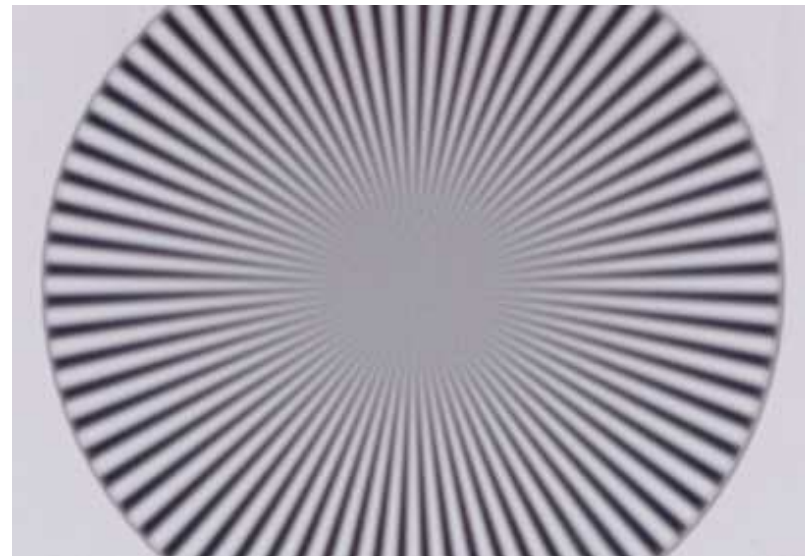
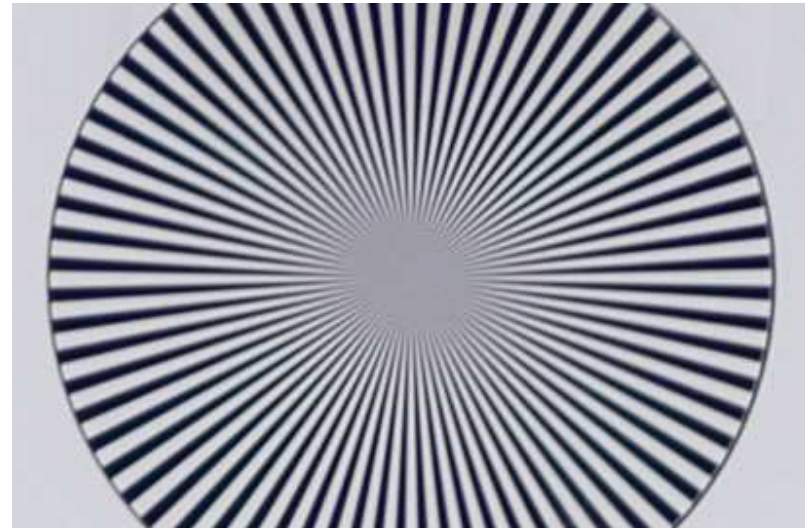
Resolution and AF-Problems I

- Anders Uschold:
Siemens Star
Petrov Star
Starburst
- Image Engineering:
Landolt circles



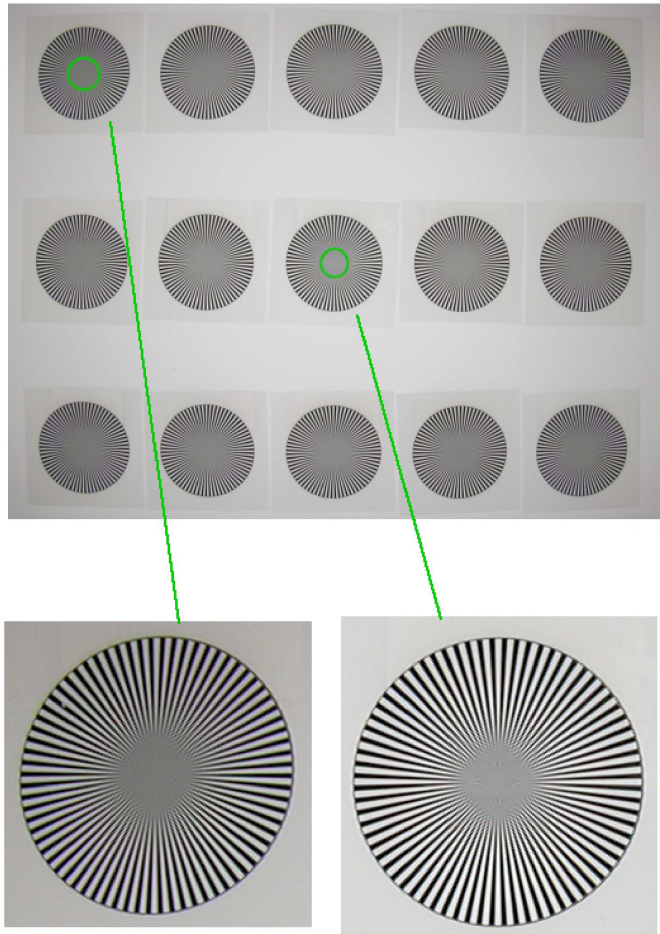
Resolution and AF-Problems II

- Both pictures from the same camera
- The AF-control LED was saying „ready“



Asymmetric lens adjustment

- well centered lens system

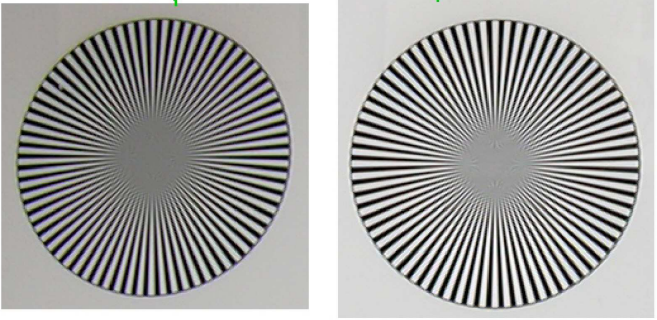
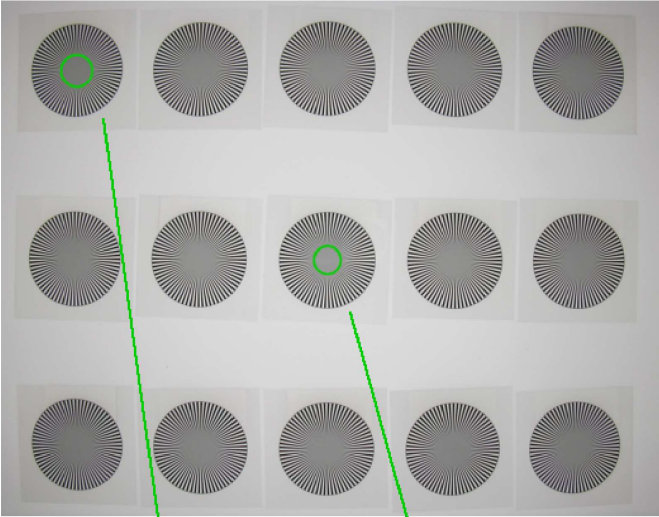


Photokina 2002

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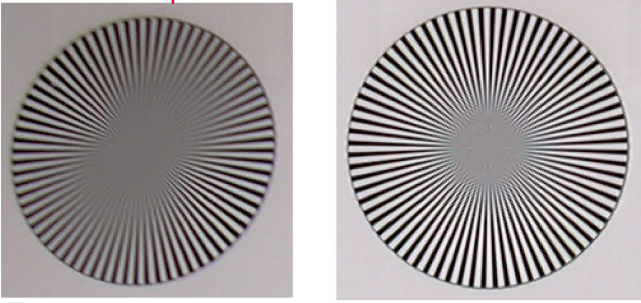
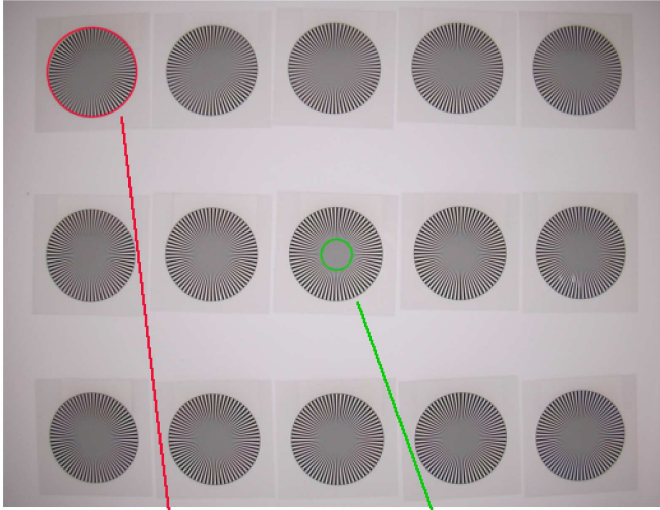
Asymmetric lens adjustment

- well centered lens system



Photokina 2002

- bad centered lens system



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Conclusions

- Dynamic range – more steps in the test chart
- Noise Measurements while Noise suppression
- Color reproduction
- Focusing problems and resulting loss of resolution
- Mechanical lens problems could lead to wrong results

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