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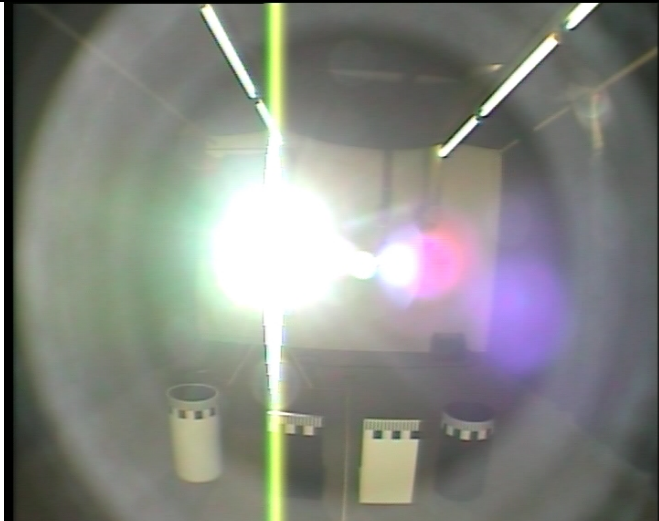51105 Cologne

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Guideline for the evaluation of optical artefacts of camera-monitor devices during testing under low sunlight condition

Optical artefact	Relation to 2003/97/EC	Impact on the monitors image and concequence	Measurement	Limit
Blooming and lens reflections	Annex II B. Number 2.2.1. *	Occultation of the field of view and therefore of the objects	- With the illumination of the laboratory: determine the size of all outshined areas on the monitor $A_{outshine}$ - Determine the display size of the monitor $A_{Monitor}$ - Determine the ratio $A_{outshine} / A_{Monitor}$	The ratio $A_{outshine} / A_{Monitor}$ shall be $\leq 20\%$.

NOTE: for the ratio $A_{outshine} / A_{Monitor}$ a smaller value than 20% is expected under real sun light conditions (see attached photos):

Displayed image with real sun light condition	Displayed image with the illumination of the laboratory

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Optical artefact	Relation to 2003/97/EG	Impact on the monitors image and concequence	Measurement	Limit
Smear (= vertical bright bar)	Annex III Number 6.	Occultation of the field of view and therefore of the objects	Smear appears: - with real sun light condition: determine the width of the vertical bar displayed on the monitor - determine the width of the object displayed on the monitor (without real sun light condition) - calculate the residual object width according to equation 1 Smear does not appear: - determine the width of the object displayed on the monitor (without real sun light condition) - calculate the object width according to equation 2	The device for indirect vision shall give such performances that a critical object can be observed within the described field of vision, taking into account the critical perception (8 minutes of arc).

Equation 1: $\quad \alpha['] = 60 \times 2 \times \arctan \dfrac{b - s}{2 \times r}$

Equation 2: $\quad \alpha['] = 60 \times 2 \times \arctan \dfrac{b}{2 \times r}$

with:
α   width of the object displayed on the monitor (with or without smear) in minutes of arc
b   width of the object displayed on the monitor (without smear) in mm
s   width of the smear in mm
r   viewing distance

The equations can be evaluated for different distances camera ↔ object as well as for different viewing distances.

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1. Installation instructions within the instructions for use resting upon the intended context of use:

a) description of the intended context of use

b) for the camera
- Specification of the minimum mounting height in order to cover the field of vision. NOTE: This measure is determined e.g. by experiment.
- Specification of the maximum mounting height and if applicable a table for consideration of different viewing distances.

c) for the monitor
- The viewing direction of the monitor shall roughly be the same direction as the one for the main mirror.
- Protection against extraneous light.

2 Safety instructions within the instructions for use:
- Under low sunlight conditions (or other direct/indirect irradiation with strong light sources) line-of-sight obstruction may occur in parts of the image displayed on the monitor.
- Extraneous light reduces the luminance contrast of the monitor; the monitor has to be protected against extraneous light e.g. by mounting

*) Directive 2003/97/EC , Annex II B: 2.2.1. The camera should function well under low sunlight conditions. The camera shall provide a luminance contrast of at least 1:3 under low sun condition in a region outside the part of the image where the light source is reproduced (condition as defined in EN 12368:8.4). The light source shall illuminate the camera with 40000 lx. The angle between the normal of the sensor plane and the line connecting the midpoint of the sensor and the light source shall be 10 °.