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EFFICIENT ENERGY FOR EU CULTURAL HERITAGE

High quality – low impact lighting

Alexandra Troi, EURAC research

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Daylight (redirection)

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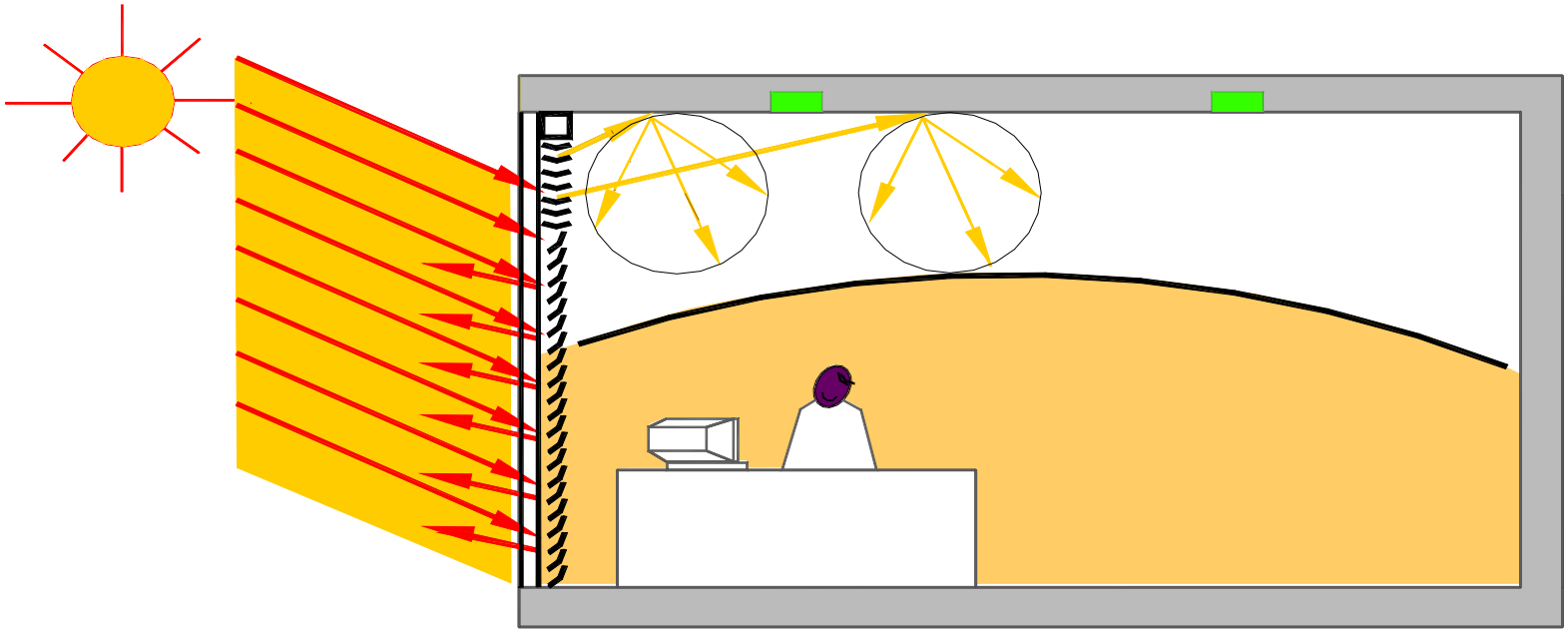
research & development

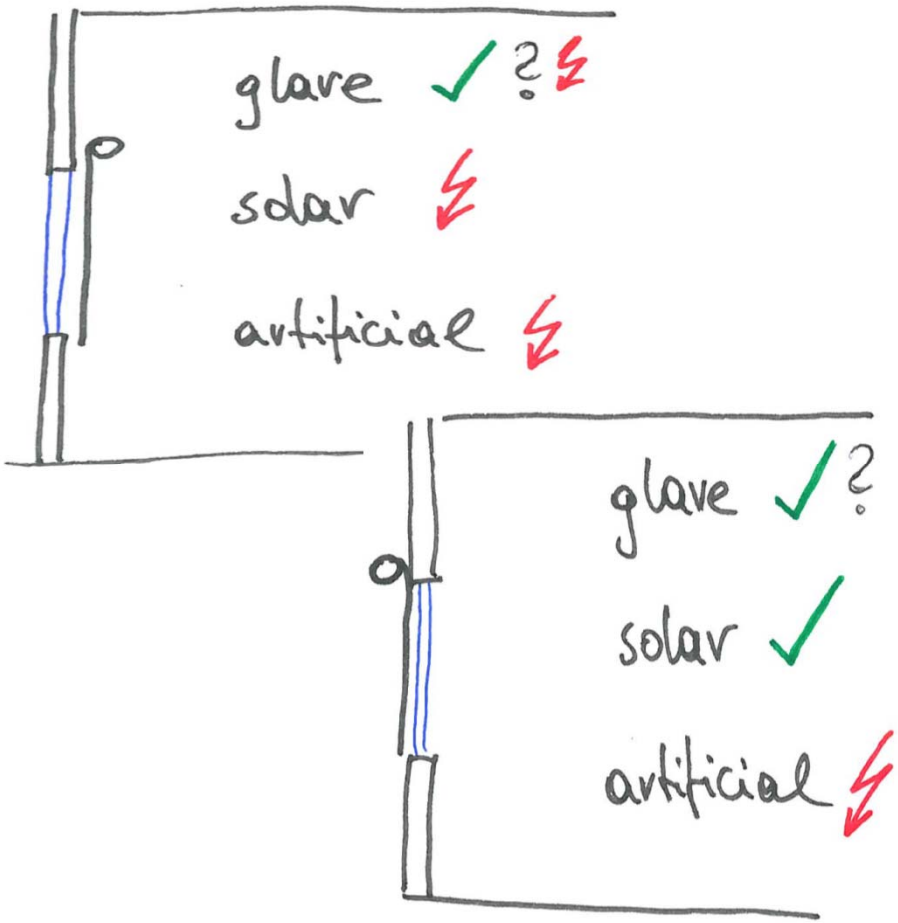
EURAC
research

Principles of daylighting

Visual comfort, daylight redirecting, sun shading

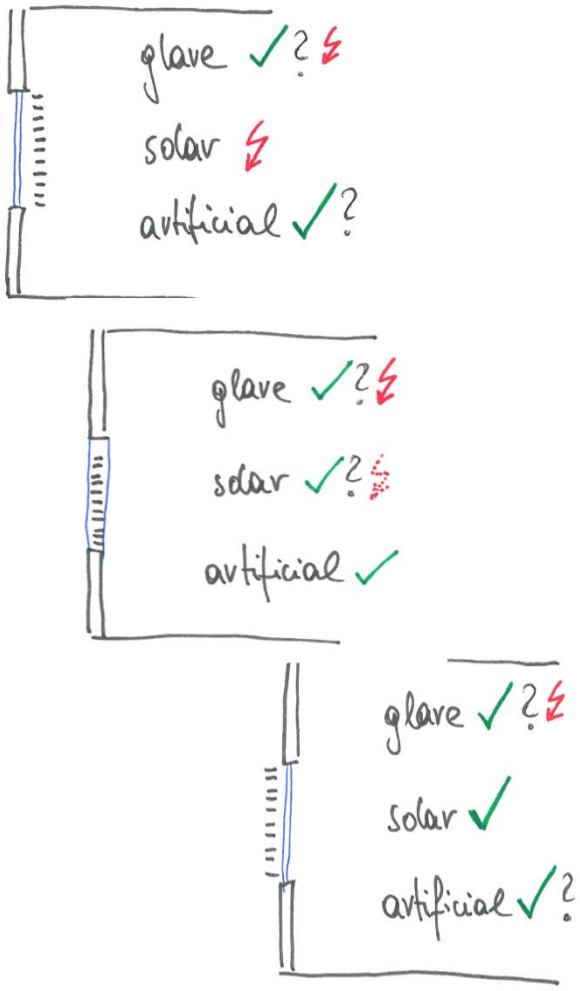


Screen
made of textile or PVC



- A screen made of textile or PVC is able to reduce glare if the visible transmittance is low.
- Solar control capacities depend on the position of the screen: generally, an internal system has weak solar control abilities.
- The need for artificial light is high, because if lowered the daylight transmittance is low and the room is badly illuminated.

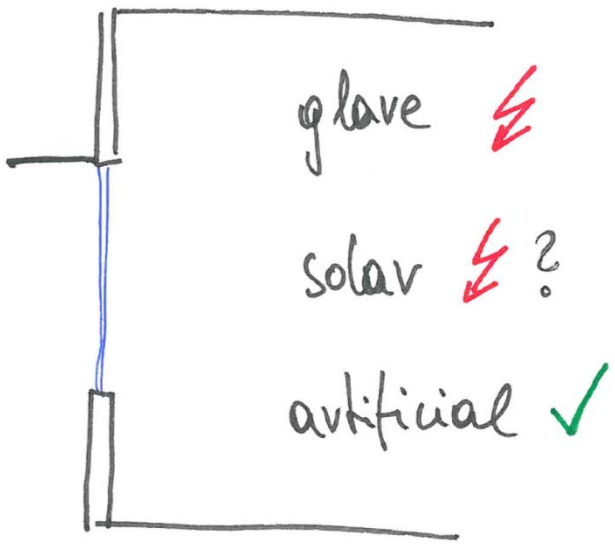
Lamella systems



Good potential for exploiting daylight:

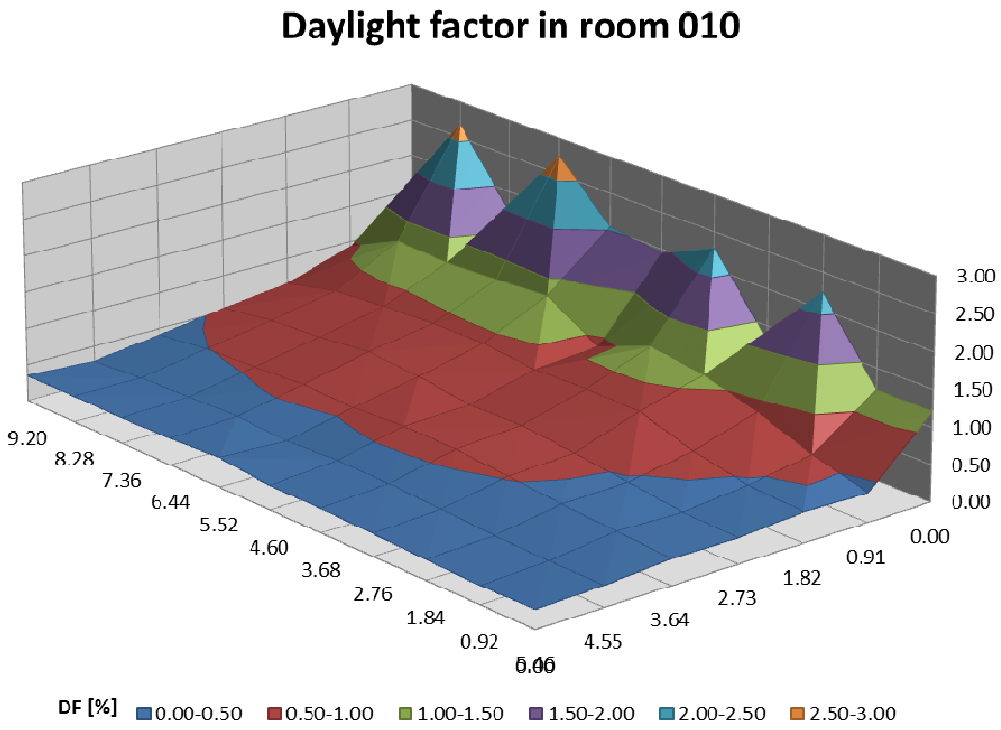
- Depending on the shape (konvex or koncav) the lamellas redirect daylight into the rooms.
- If split into two or more subsystems: lower part provides glare protection (by closing the lamellas) the upper parts controls daylight distribution and solar gains in winter and summer times (i.e. by closing, opening the lamellas).
- The magnitude of Solar heat gains coefficient depends on the position of the system: generally the more outside the smaller the SHGC.

Static overhangs



Static overhangs (or brise soleil) are thought to be the simpliest measure to control solar gains. Their functionality is limited to summer times (highest sun elevation). For glare protection additional internal systems has to installed. The need for artificial lighting is then comparable to screen systems.

Example:
CS5 Höttinger School



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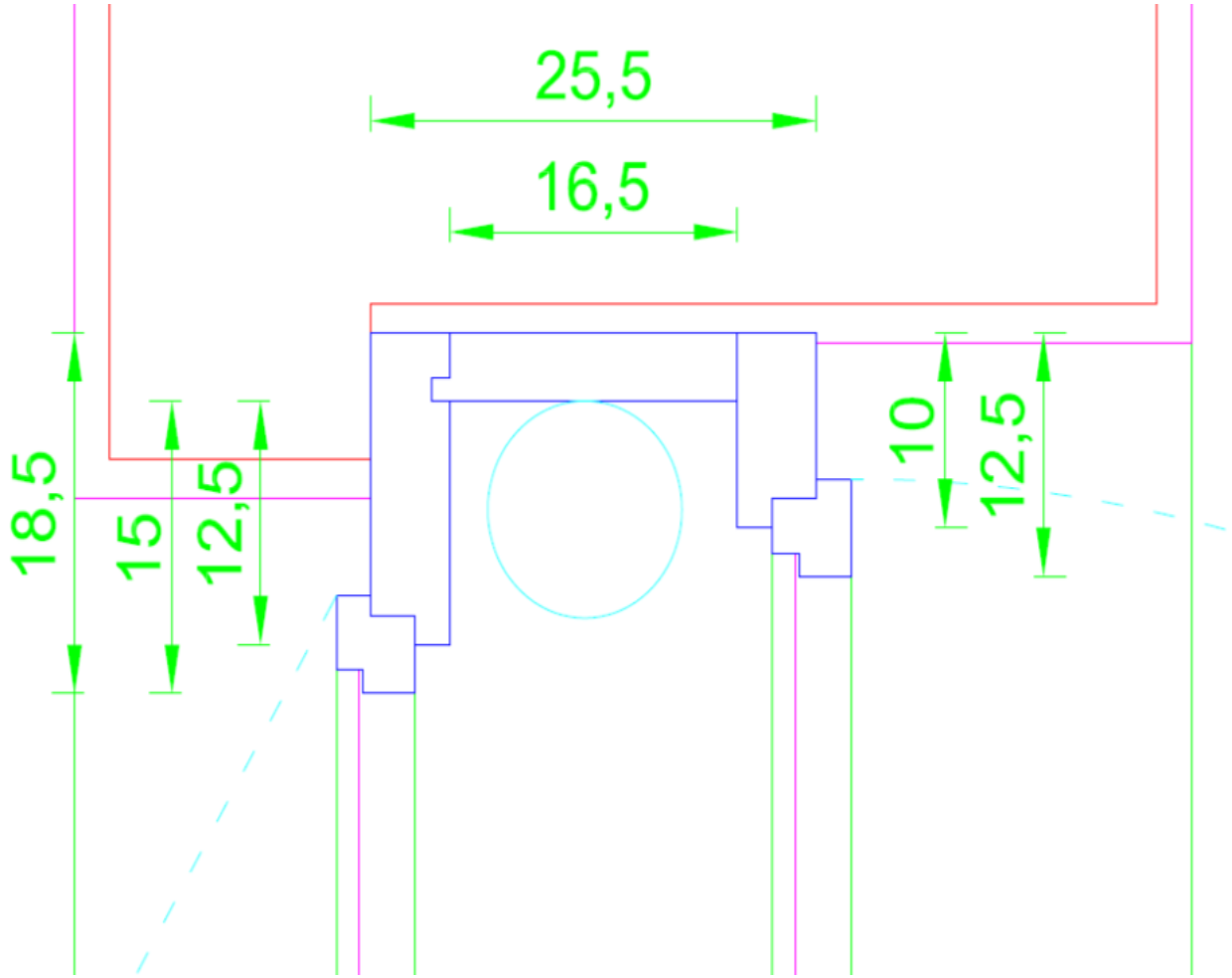

Example:
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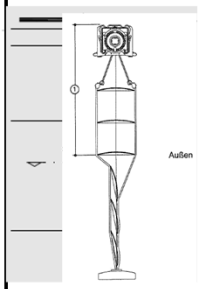
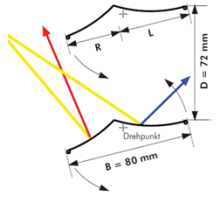
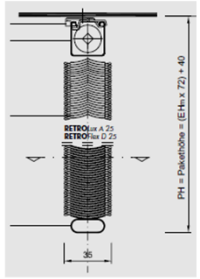
IF50	E 50/80 Genius	Duobehang E 80LD	E50 L BAP	TAGESLICHT-RAFFSTORE RETROLu	Naturraff	RETRO Flex 25
HELLA	WAREMA	WAREMA	WAREMA	Schlotterer	SUN-KONTOR GmbH	RETRO SOLAR (Köster)
						
System 1	System 2	System 3	System 3 mit rho=80%	System 4	System 5	System 6
140mm bei 1500 / 155 bei 2000mm	217 bei 1800 / 223 bei 1900mm	165 bei 1800 / 169 bei 1900mm	165 bei 1800 / 169 bei 1900mm	-----	ca. 250 bei 1900	143 bei 1800 / 149 bei 1900 mm

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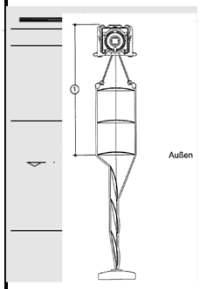				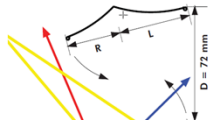		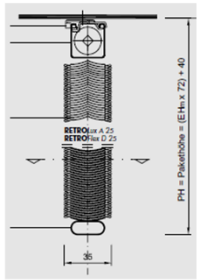
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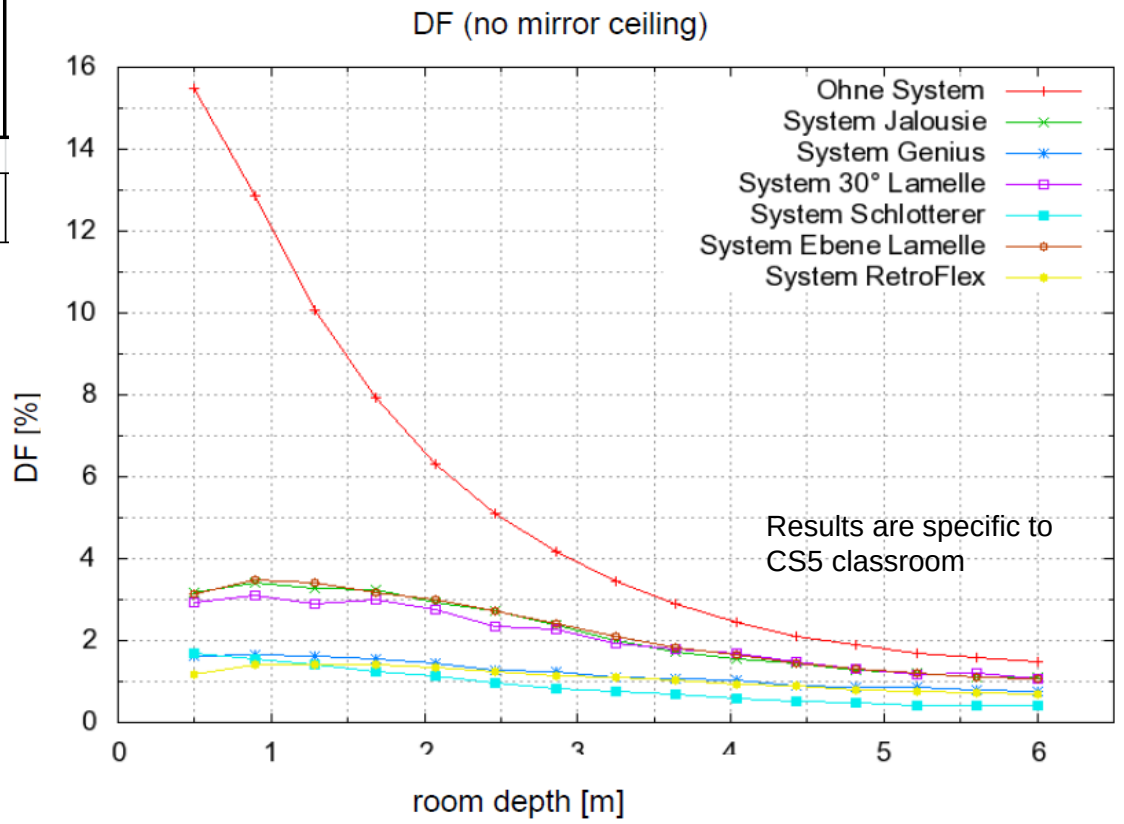

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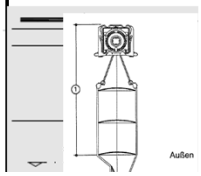				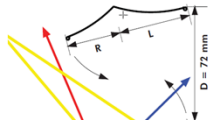		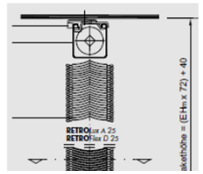

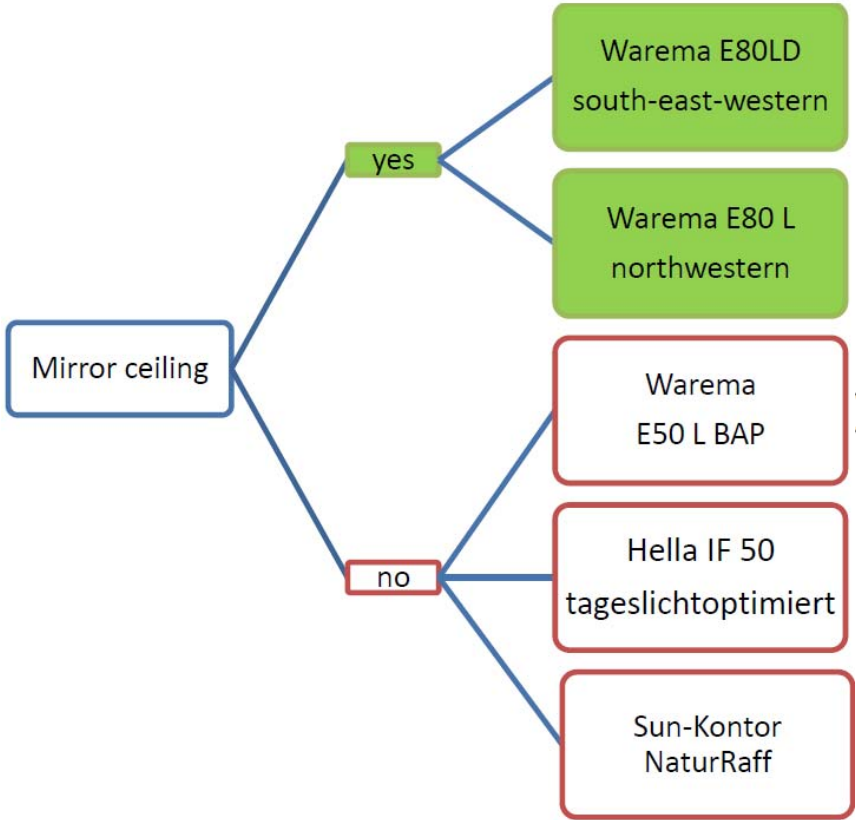

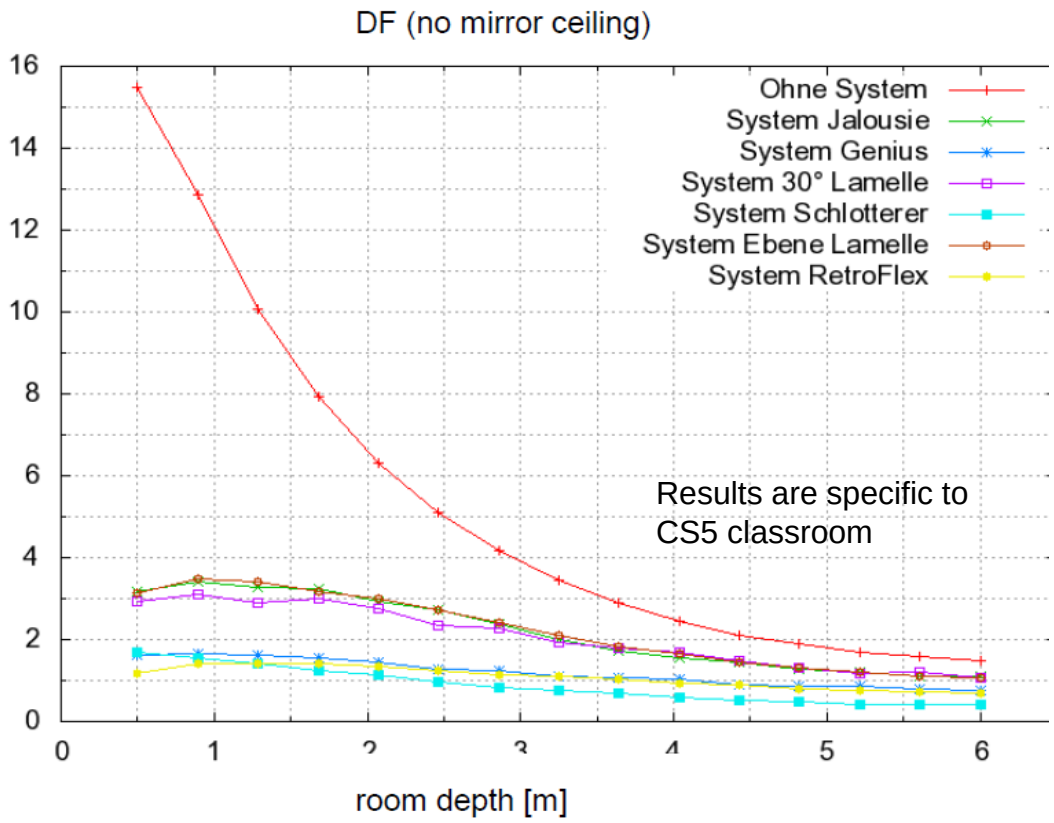

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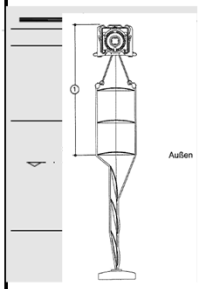		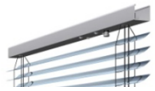		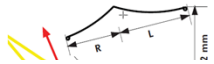		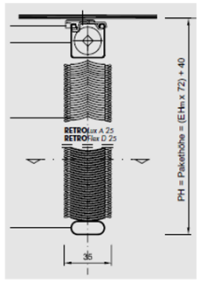
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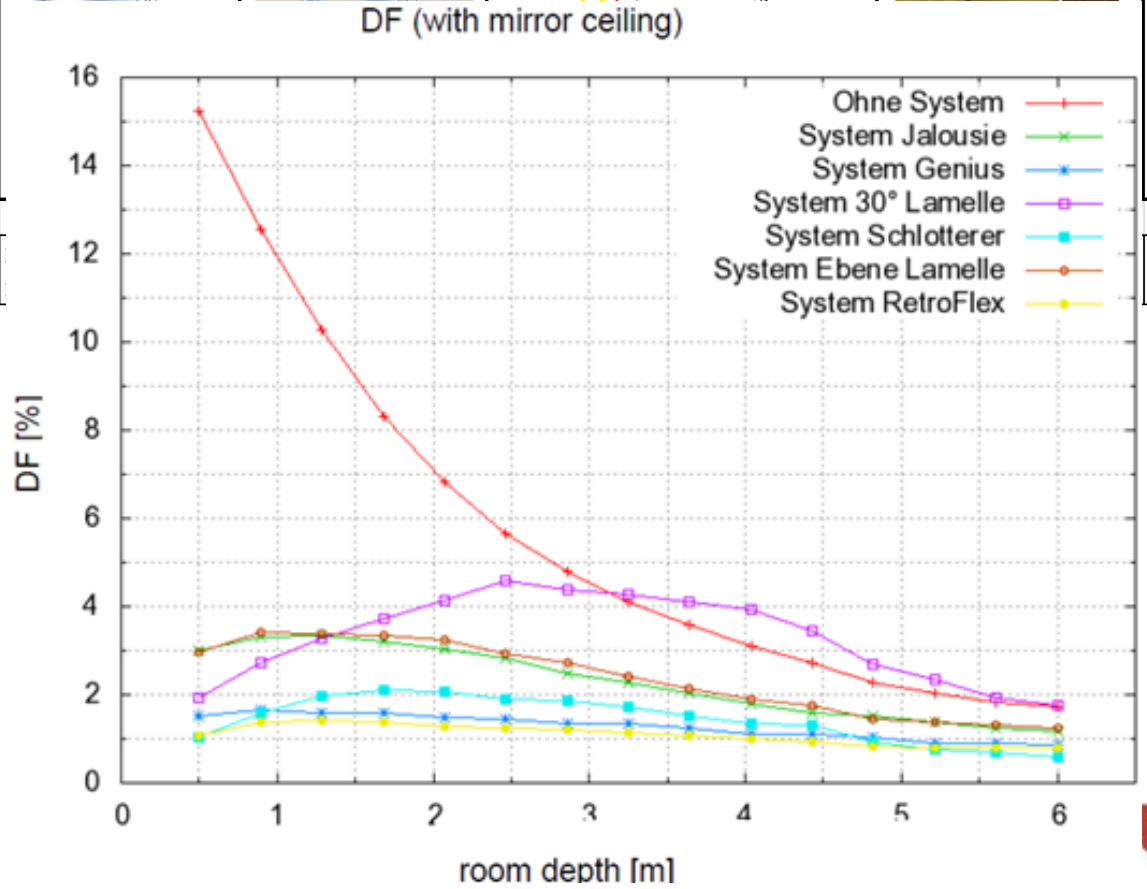

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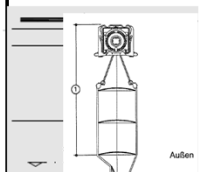
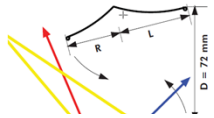
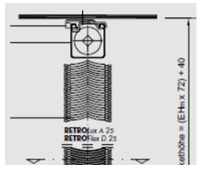
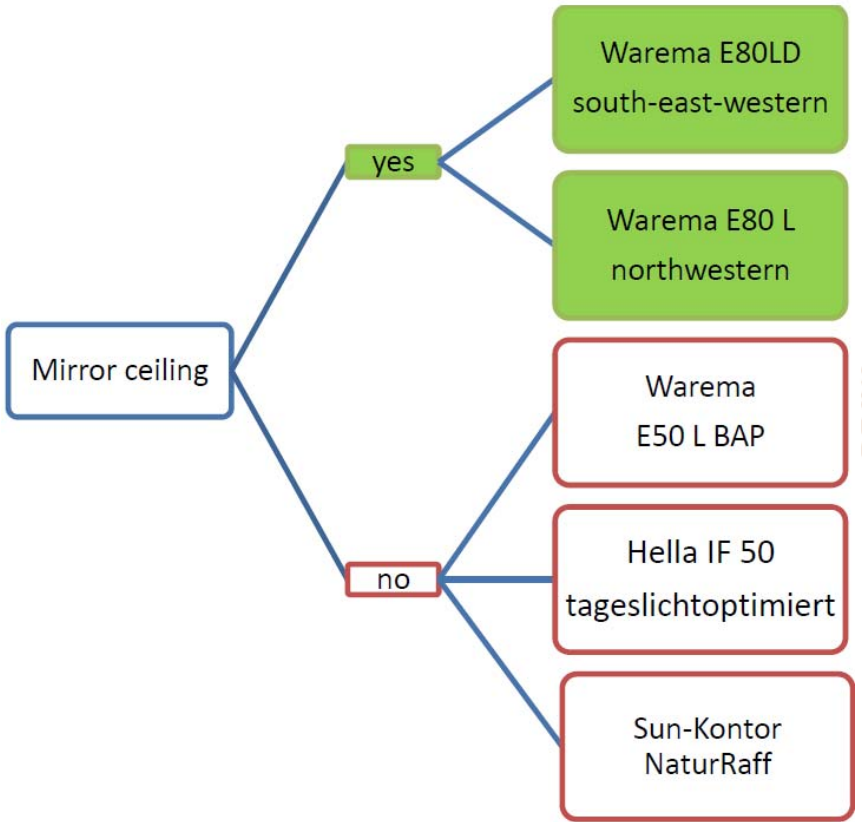
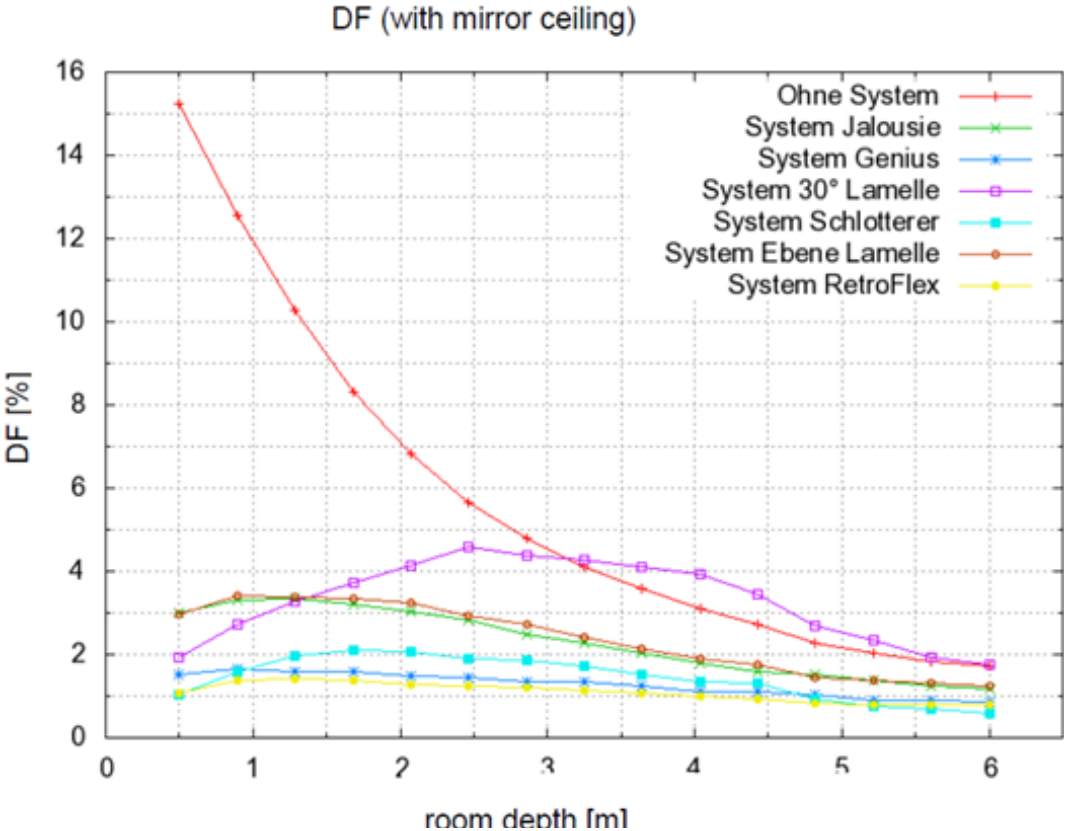
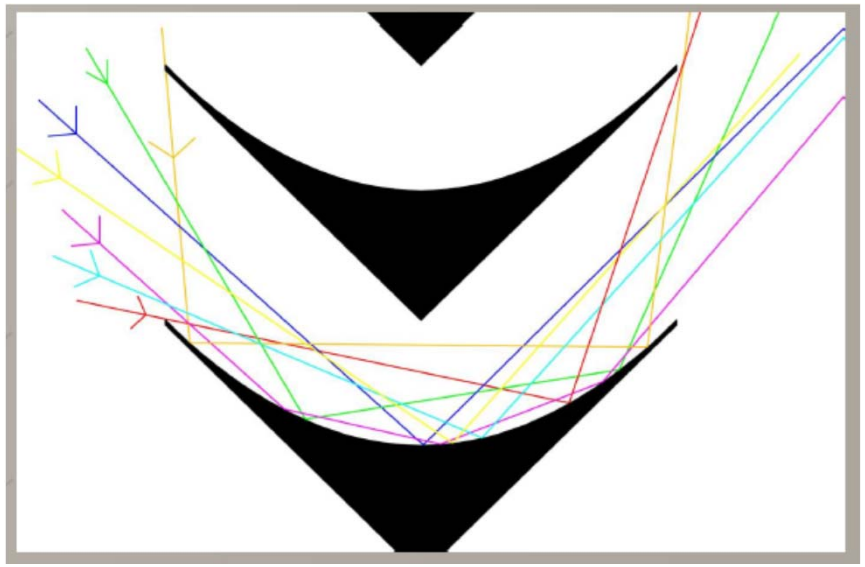
						





Example:
Idea developed by Bartenbach students



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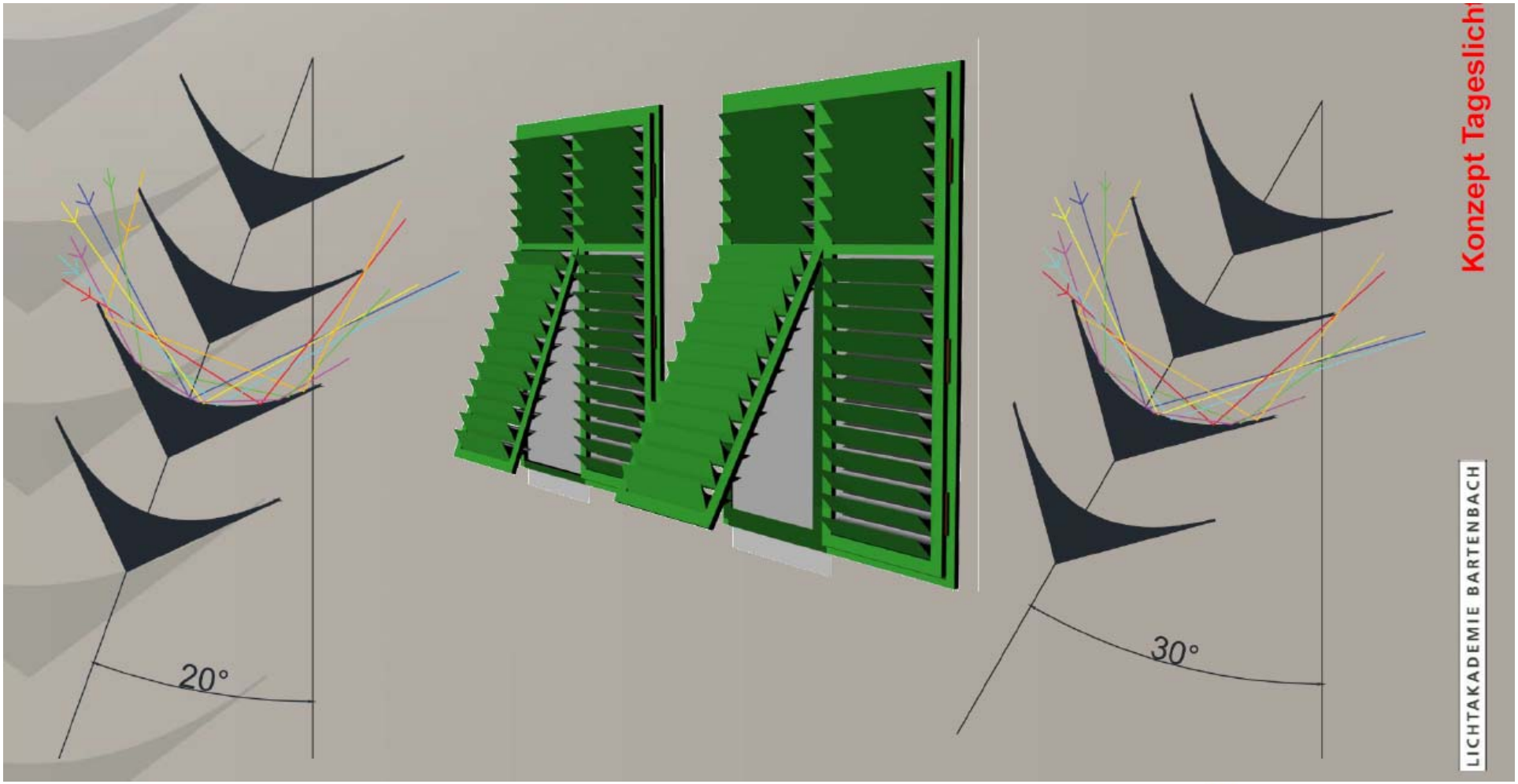

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Example:
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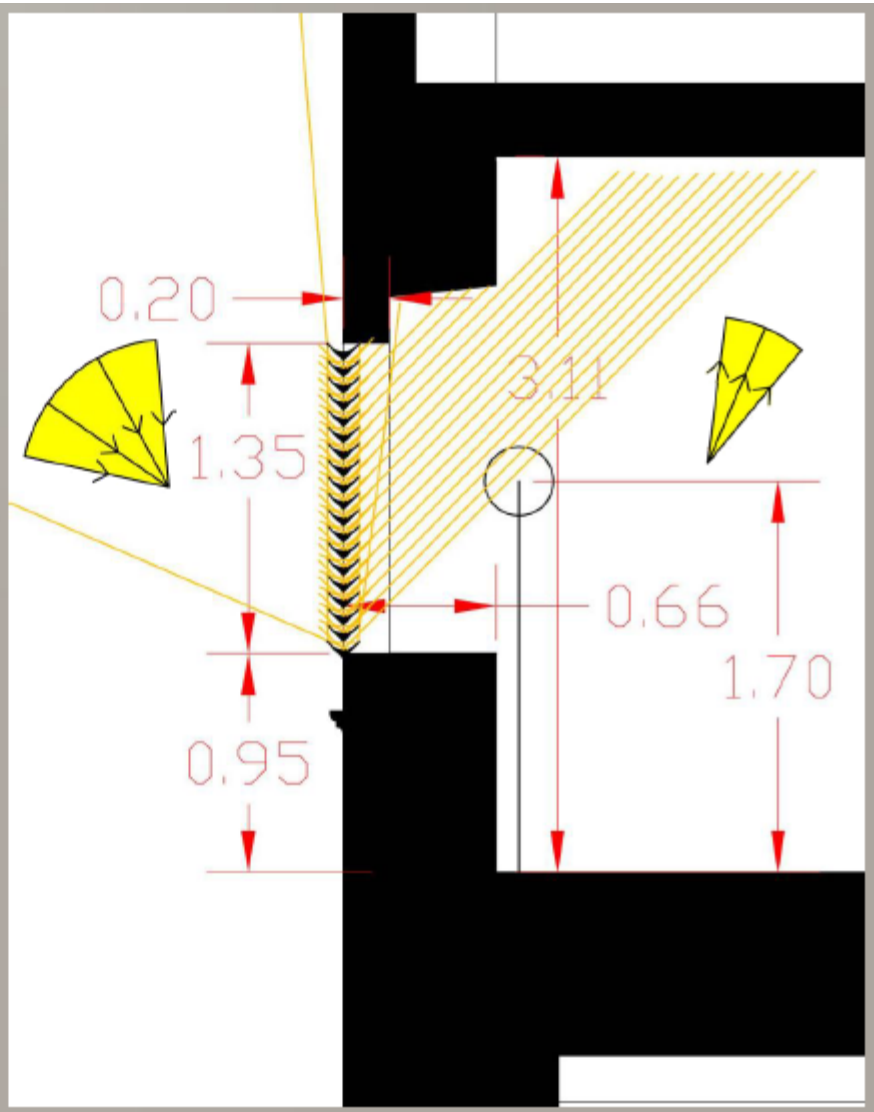
Fensterschnitt

Sowohl das direkte Licht der Sonne als auch das diffuse Tageslicht wird aus seinen verschiedenen Richtungen über die Lamellen in den Raum geleitet

Eine Blendung ist aufgrund des steilen Winkels von mind.45 fast ausgeschlossen, selbst beim direkten Herantreten an das Fenster

Rückreflexion des Tageslichteintrags von der weißen Decke in den Raum



Konzept Tageslicht

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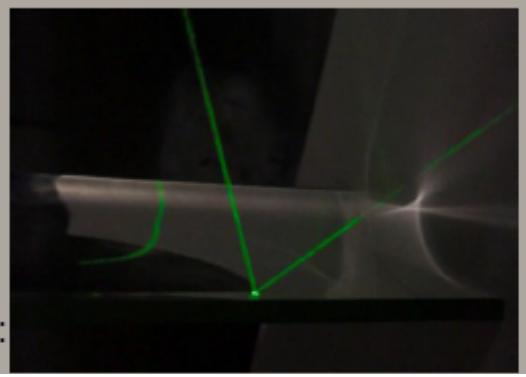
Versuchsaufbau

Konzept Tageslicht

Strahlengang:



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Product development

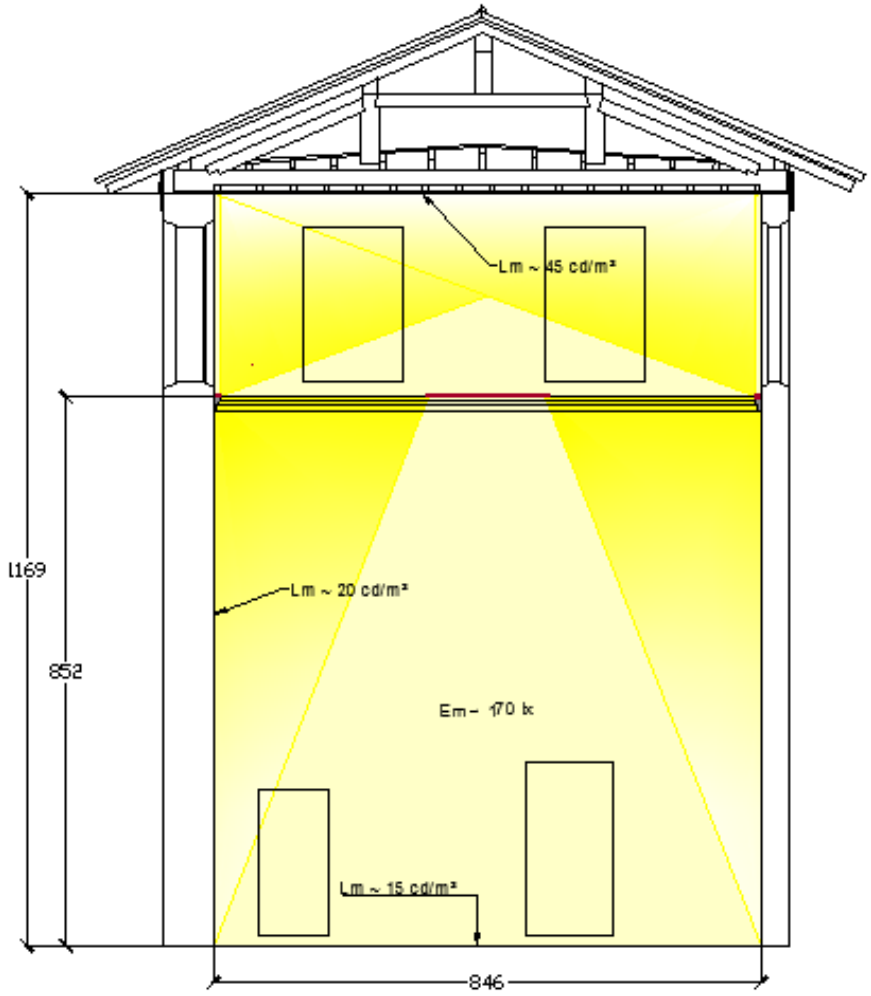
Task

- develop an efficient artificial lighting component
- that can be **installed** in a **non-invasive way**
- should provide an **optimal visual scenery**
- should **slow down** the **deterioration** process (that any material undergoes in its natural/artificial environment)

The specific development followed the bottom-up approach starting from CS2 (Palazzo d'Accursio in Bologna): The lighting concept based on the idea of illuminating a room where the walls are the demonstrated objects.

Task: visual comfort

- Luminance
  - Ratio
  - magnitudes
- Colour rendering
- Modelling/shadow
- Brilliance
- Etc…



Task: efficiency

coplayers

→ Lamp

→ Controller

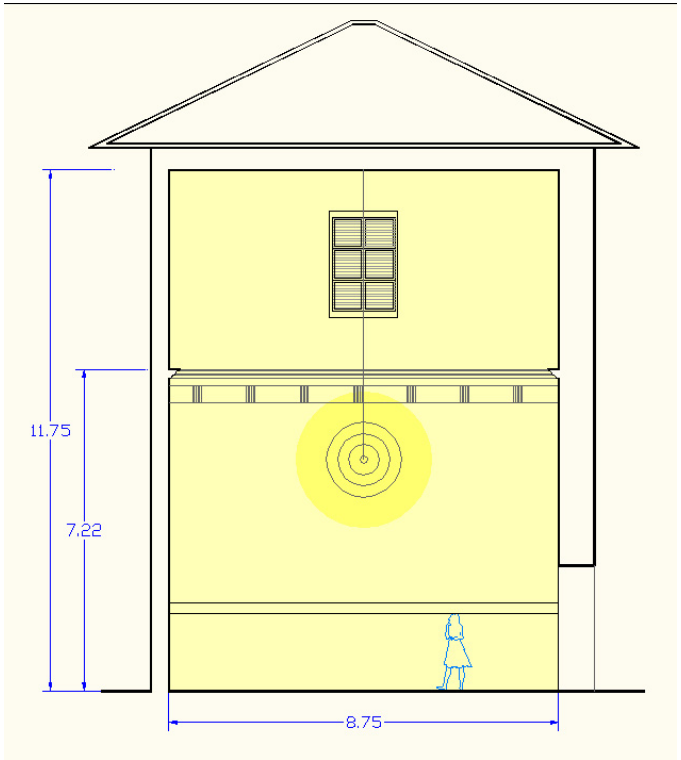
→ Luminaire

→ Room

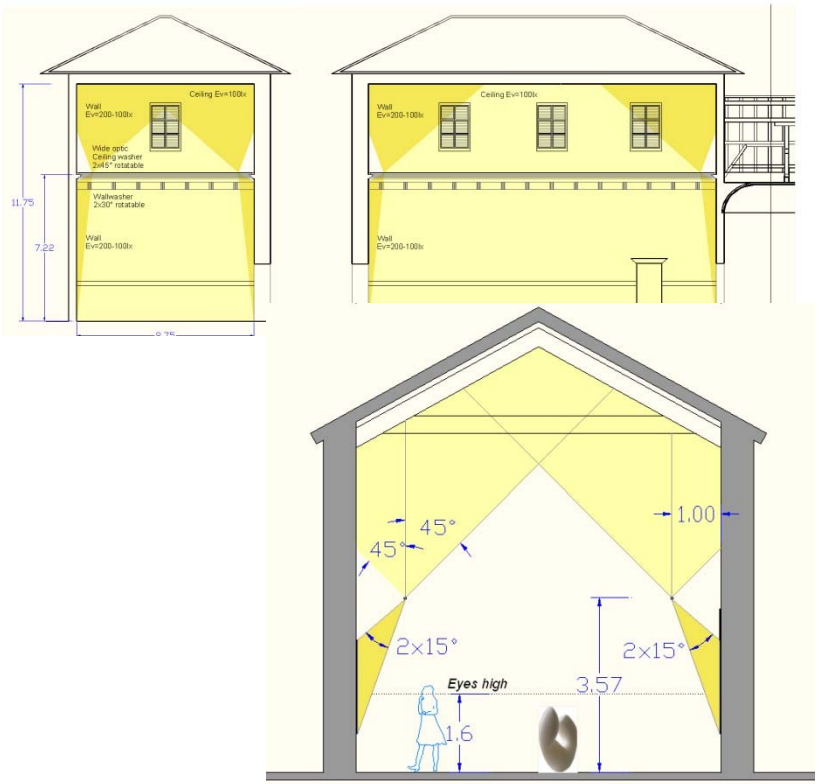
CS2 Palazzo d‘Accursio Sala degli Stemmi

Applicability of concepts

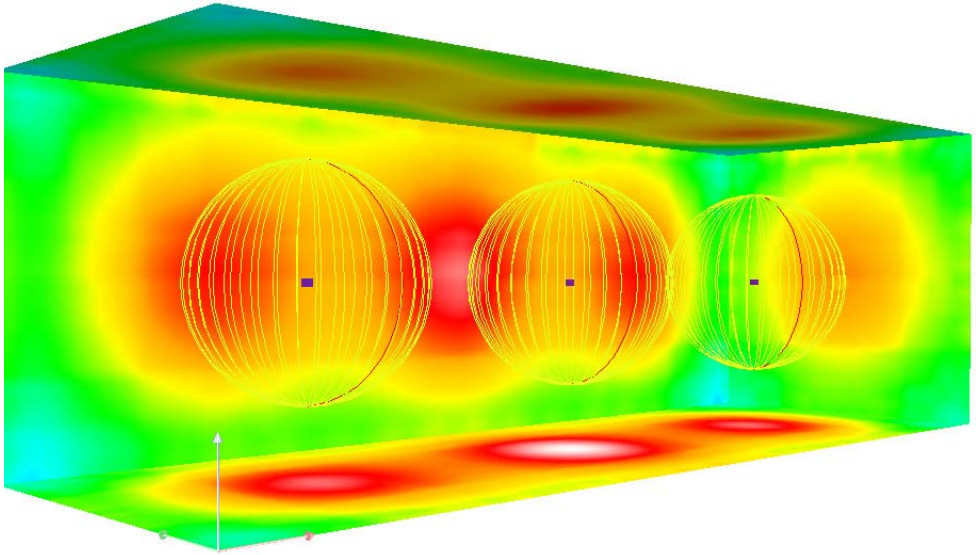
CHANDELIERS



WALLWASHER

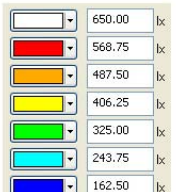


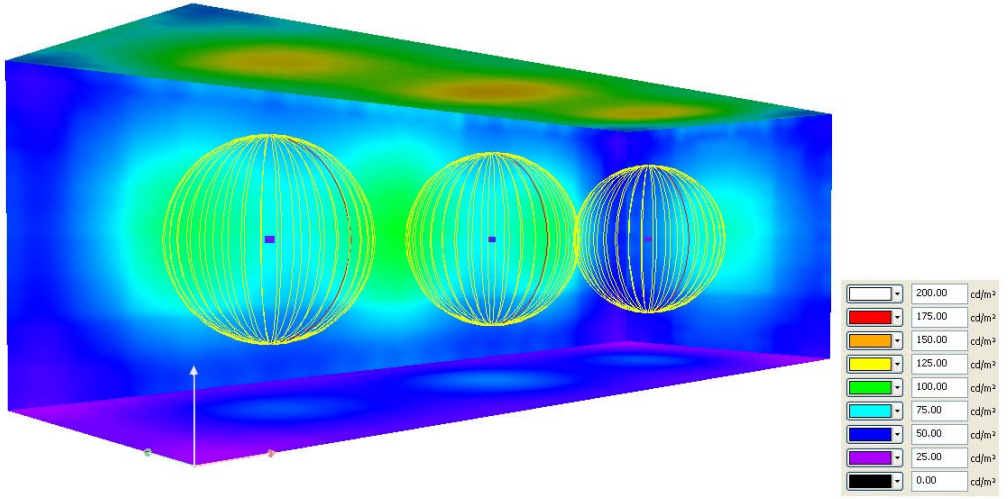
Chandeliers



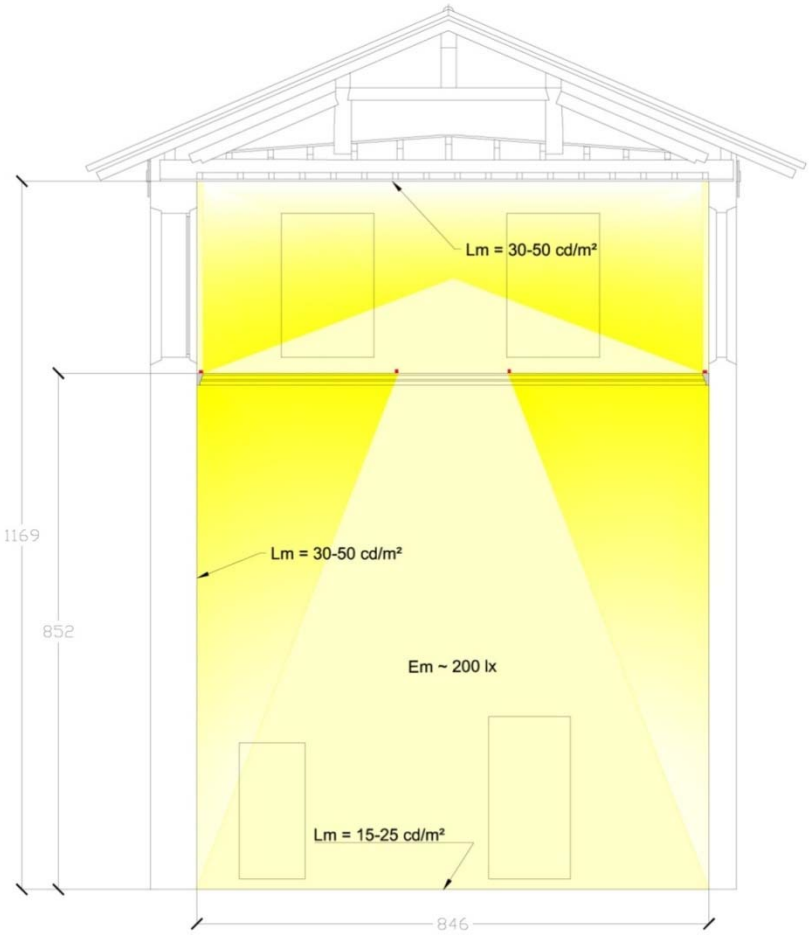
Glare problem!

CHANDELIER



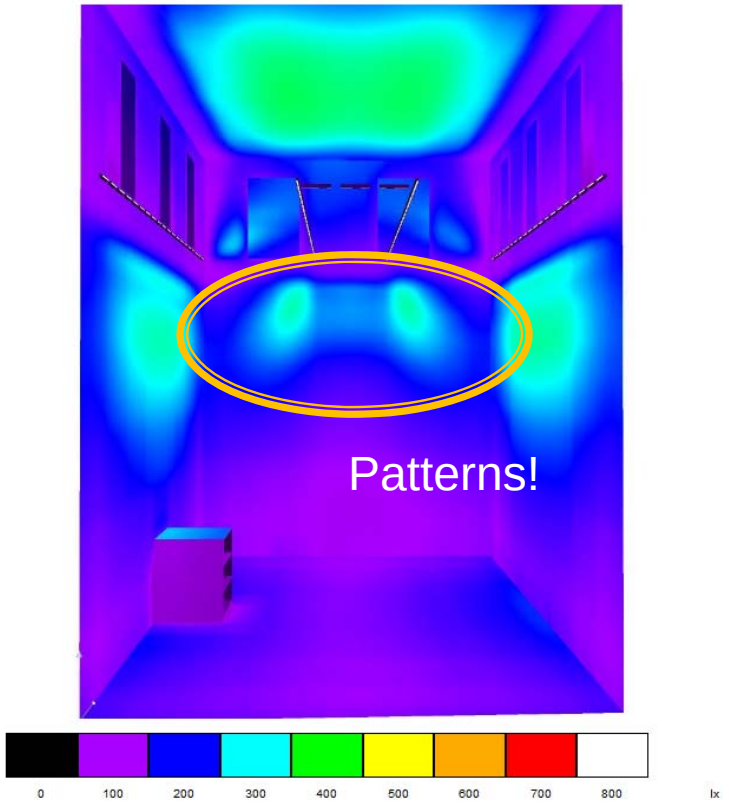


Wallwasher



EXISTING PRODUCTS

projektleuchten



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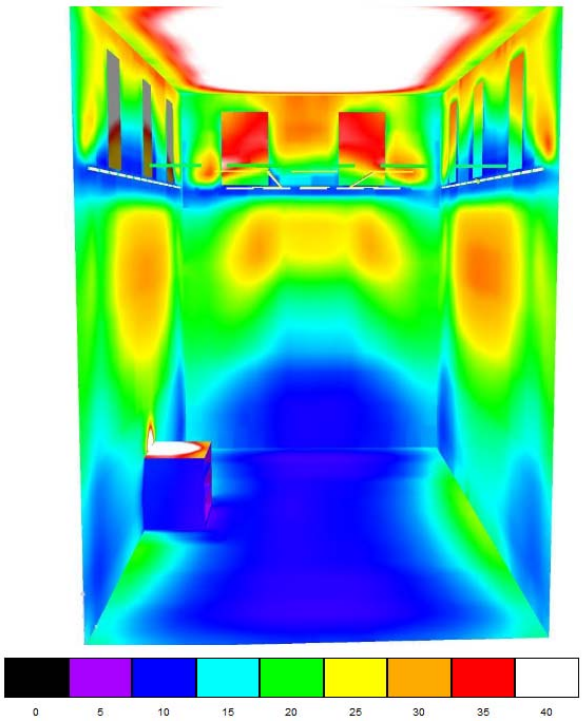
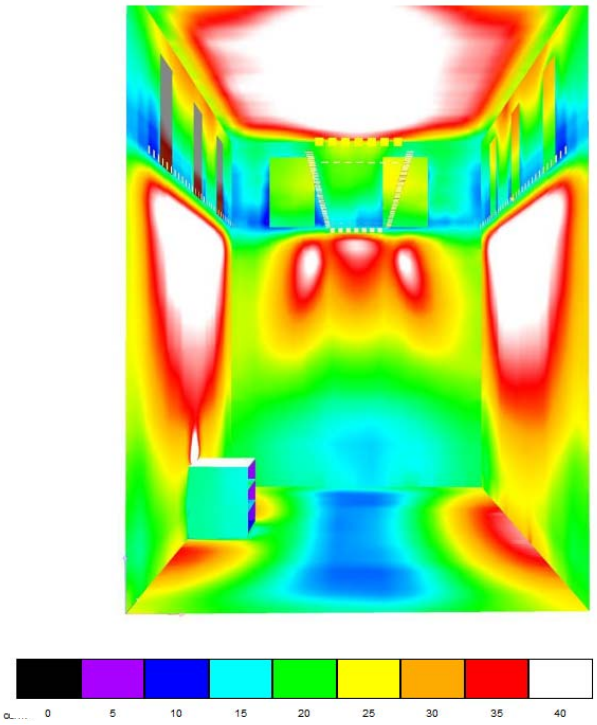
Wallwasher

EXISITING PRODUCTS – MORE EXAMPLES

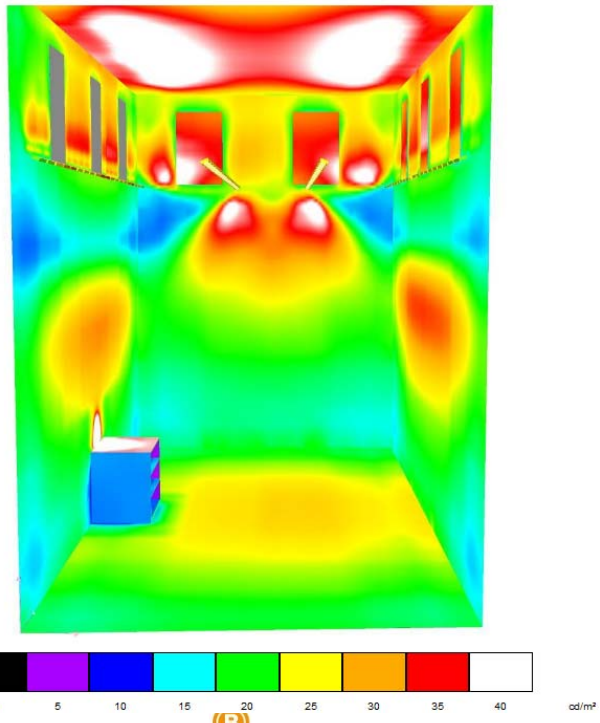
artluce



XAL



iguzzini



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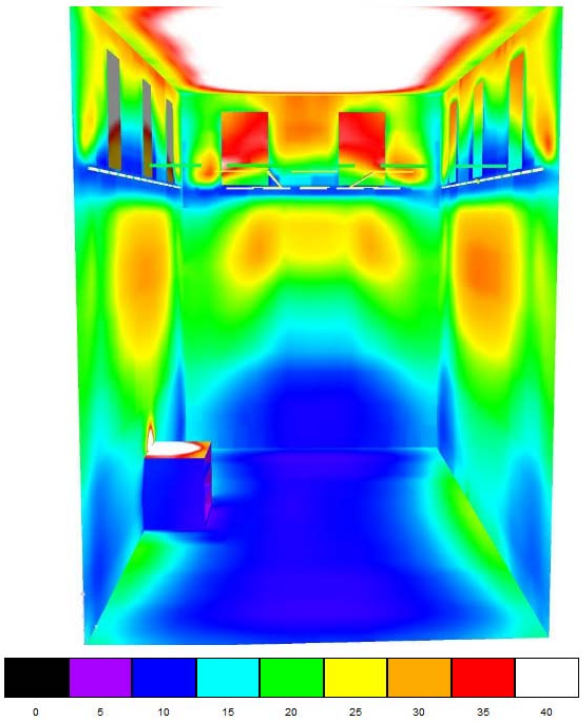
artluce



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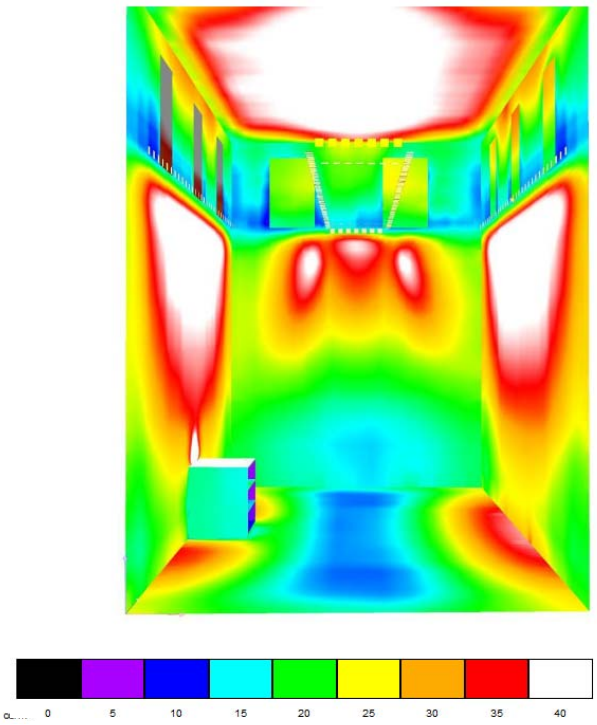

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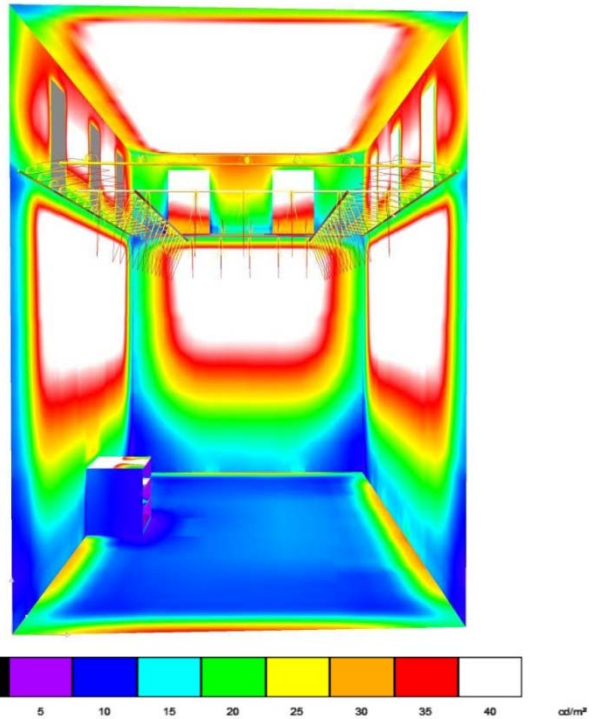

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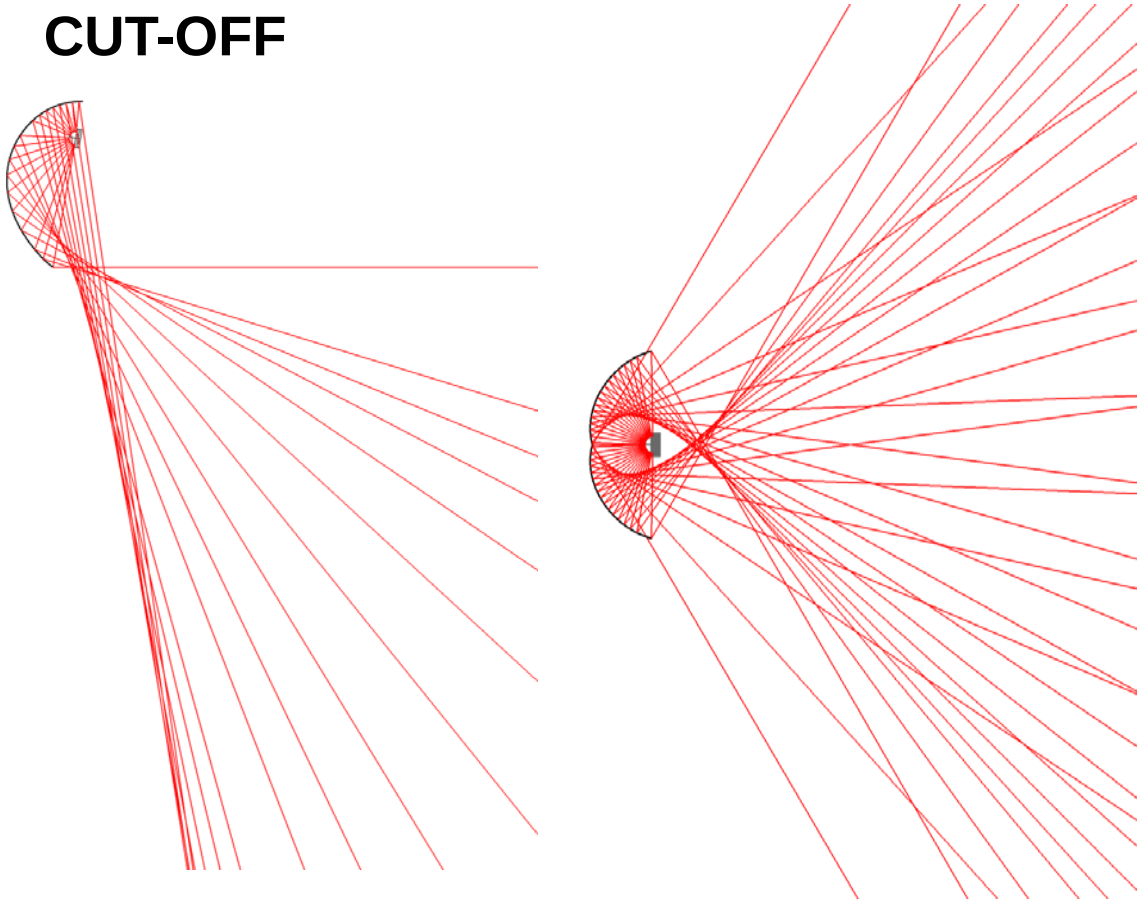
VERTICAL & HORIZONTAL CUT-OFF



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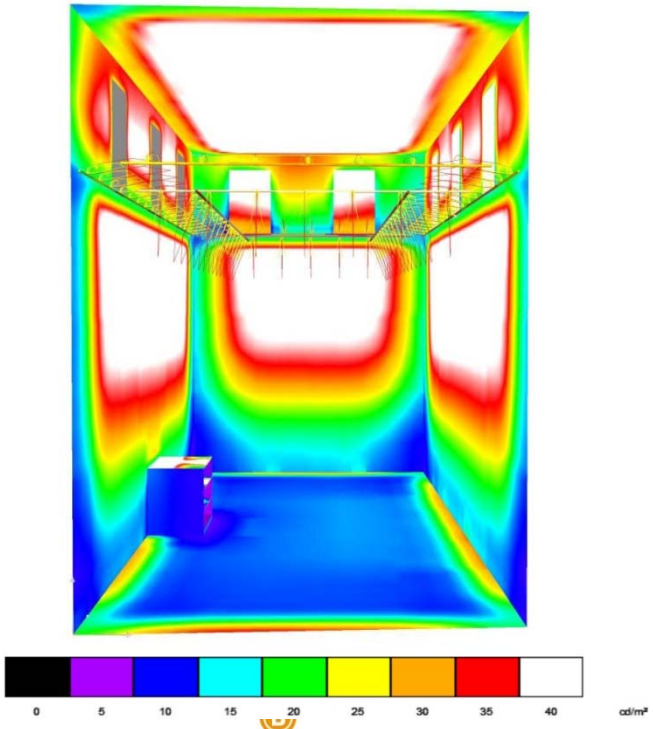

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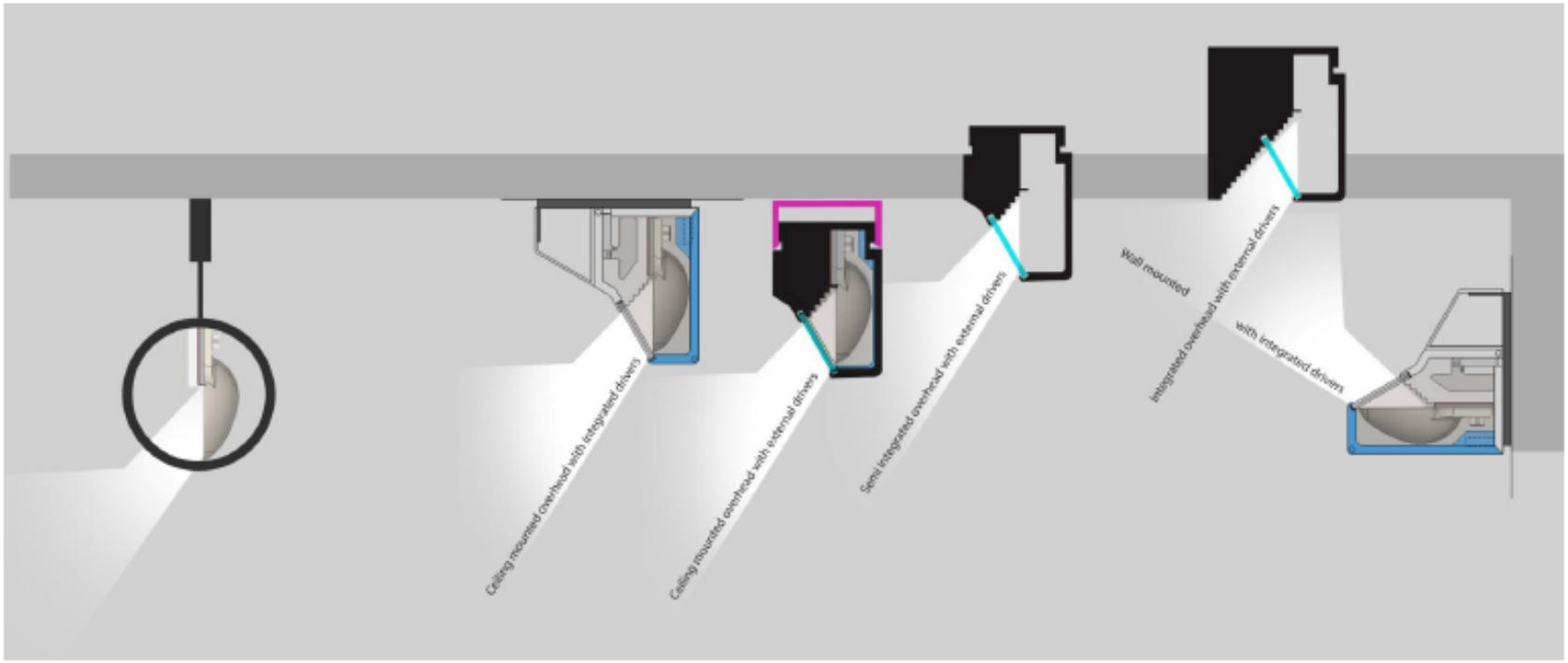
L˙chtLabor

wallwasher - perfect glare control

productrange



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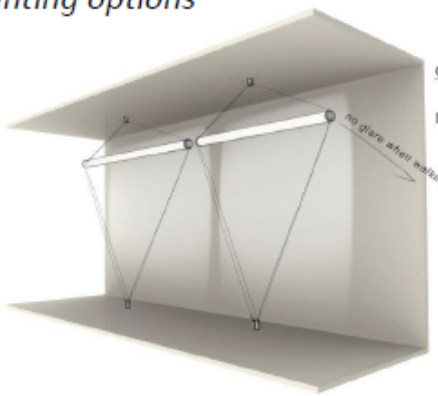
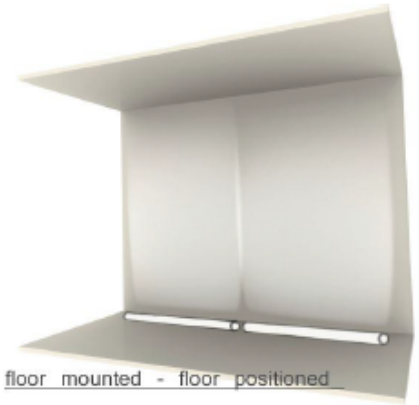
wallwasher - perfect glare control

mounting options



ceiling mounted - ceiling and floormounted

minimum mounting impact



floor mounted - floor positioned

without any/ with little impact on architecture

placed on a cornice

to enlighten ceiling artwork - fresco painting without any impact on archtecture

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mounting options

wall mounted

minimum mounting impact

stand mounted

without any impact
on architecture

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wallwasher - perfect glare control

qualities

little invasive

minimal to non intervention into existing architecture for positioning/ mounting of lightsource.

high uniformity

highest consistency of constant illuminance within defined field.

precise cut off

lightbeam is precisely calculated and defined – no glare.

optimized conservation - LED

non harmfull for historical/ sensitive environment by emitting no UV – rays.

dynamic white (cw/nw/ww)

two different colour temperatures out of the same lightsource [optional].

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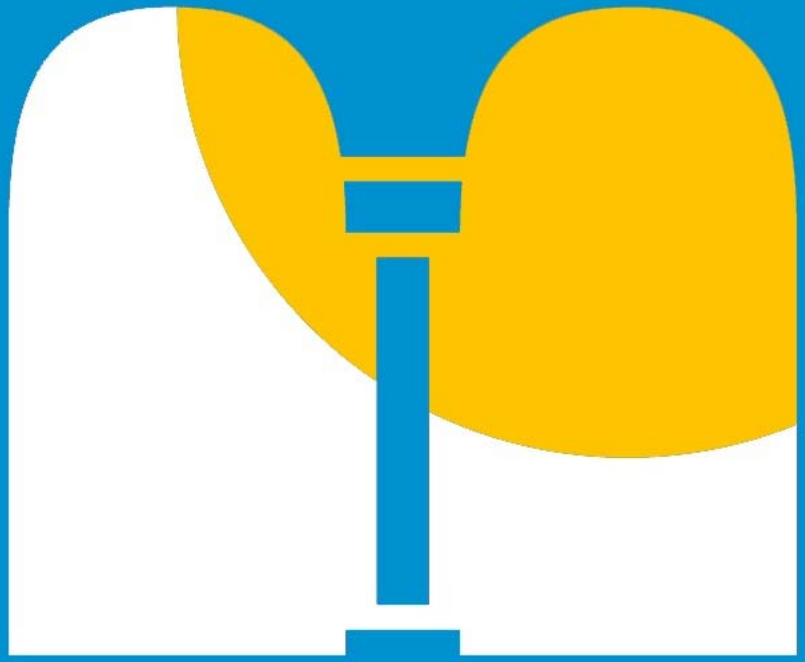

Alexandra Troi alexandra.troi@eurac.edu

Robert Weitlaner robert.weitlaner@bartenbach.com