Human Centric Lighting

2021

MODULAR
LIGHTING —
INSTRUMENTS

Agenda

1. Definition Human Centric Lighting
2. Influence from light on humans
3. New metric: MEDI
4. Modular’s HCL proposition

New year, new launch

We've started this year with an excellent resolution: *Whatever you do, do it with light!*

2021

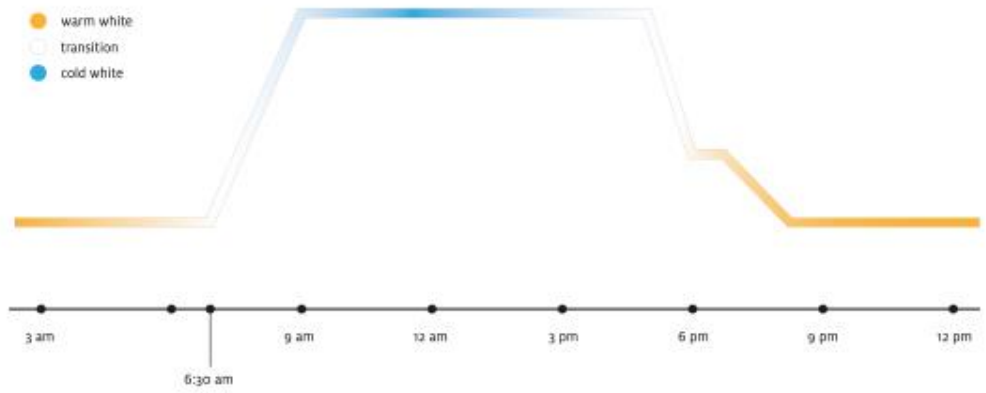
We're already announcing our first product launch of the year. Join us online for a short presentation of what's coming up.

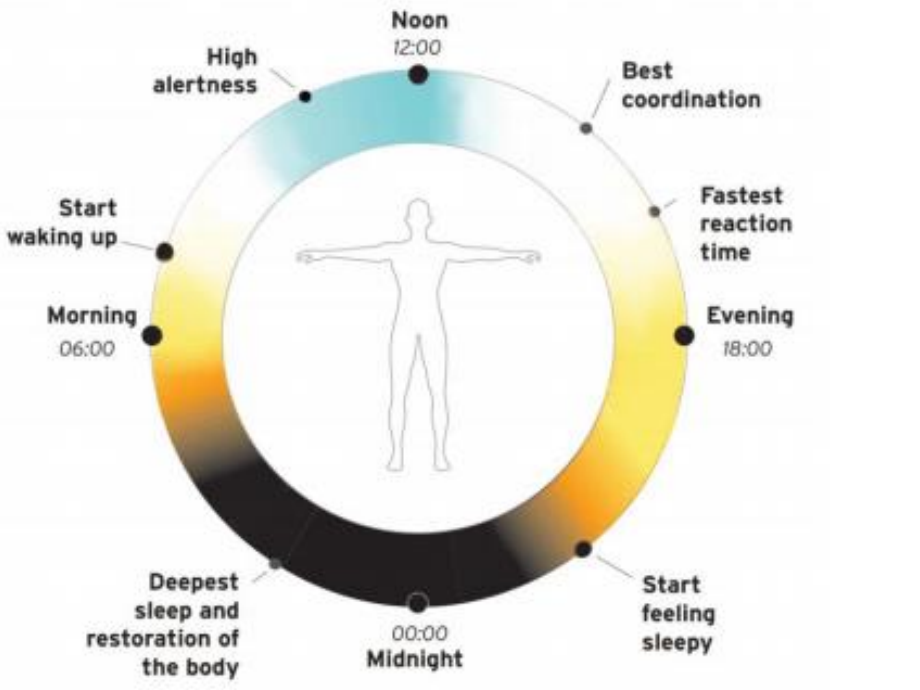
Watch the video for **Session 1: Product introduction** below.

Got a question? Contact us via the chat box at the right side of this page (click on the speech bubble icon)!

Check in on Tuesday 23/02 at 15.00 CET

Google human centric lighting





KU LEUVEN

TECHNOLOGIECAMPUS GENT

howest / we develop people

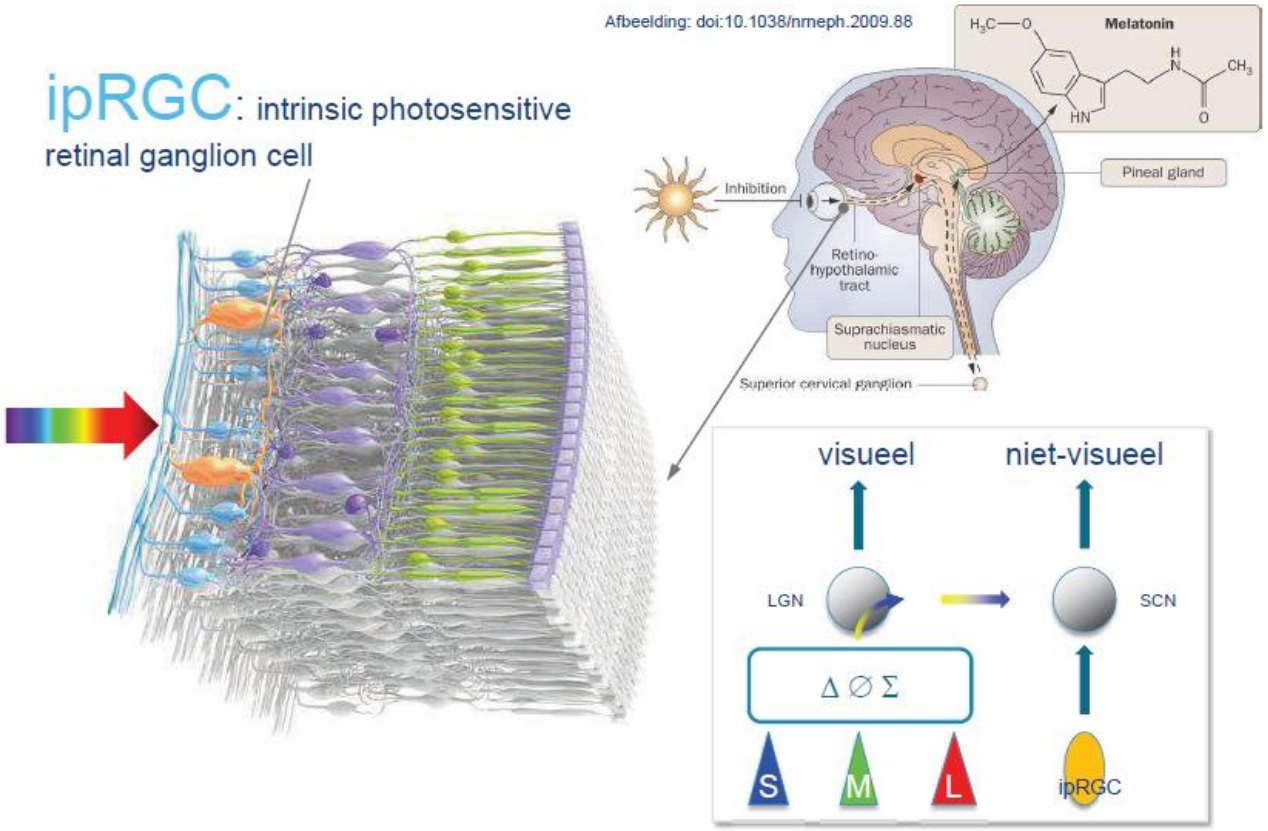
AGENTSCHAP INNOVEREN & ONDERNEMEN

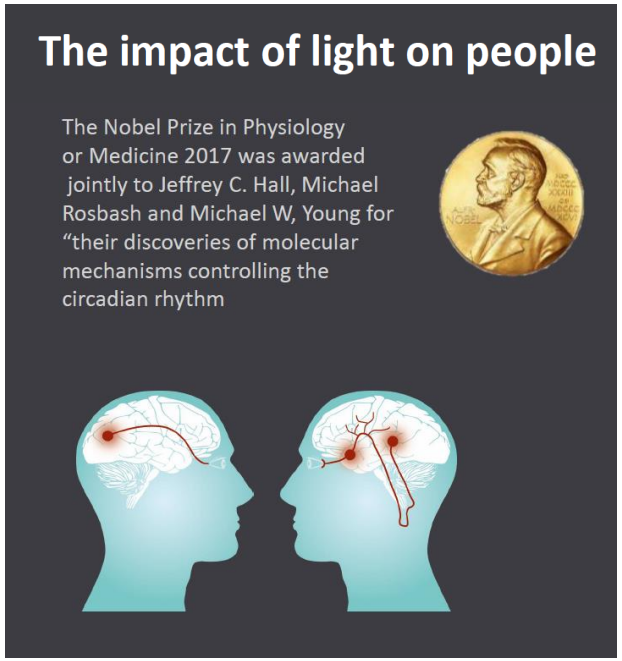
Groen Licht Vlaanderen

Samen voor sterk innoveren

VLAIO – TETRA
“Human Centric Lighting”

Signify





Luc Schlangen

CIE System for Metrology of Optical Radiation for ipRGC-influenced Responses to Light

CIE DIS 026(2018)

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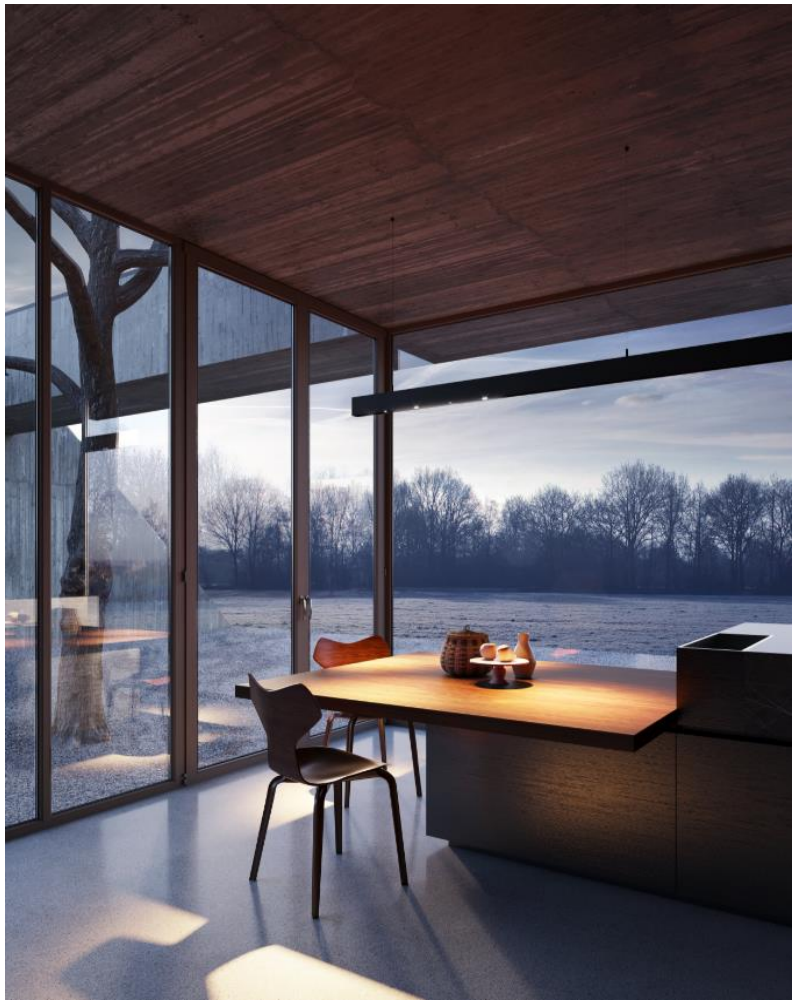
Without light there is no life.

Light regulates
the human body & mind

Human Centric Lighting

The right light with the right spectral content at the right time



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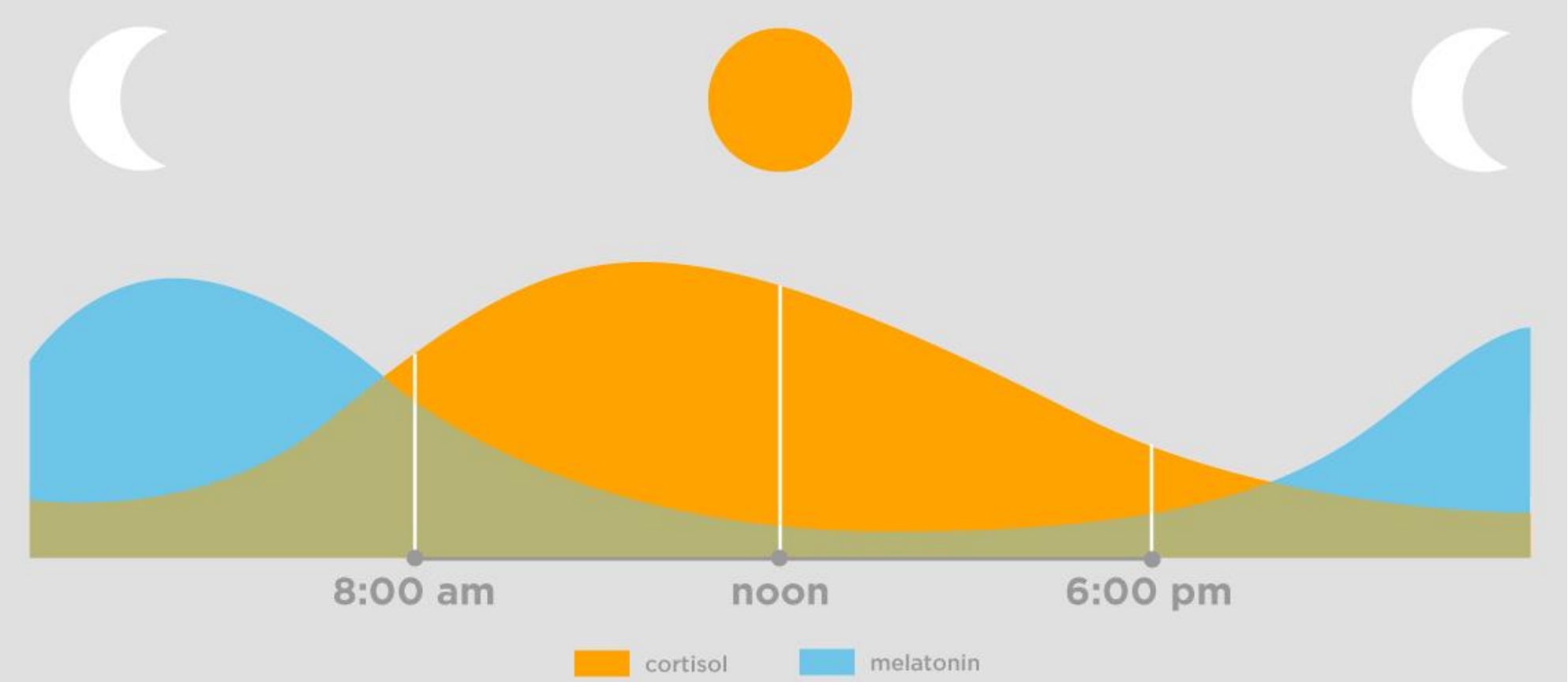
Till 200 years ago

90% daytime outdoor

Light is the most powerful regulator of the human

Light regulates our biological clock



Night
Have a good night sleep

- Lowest light levels
- Undisturbed sleep

Dawn
A good start of the day

- Cool light levels
- Raise the energy level

Day
Have a break and refresh

- Cool to warm light
- Decreased light levels

Dusk
Relax and unwind

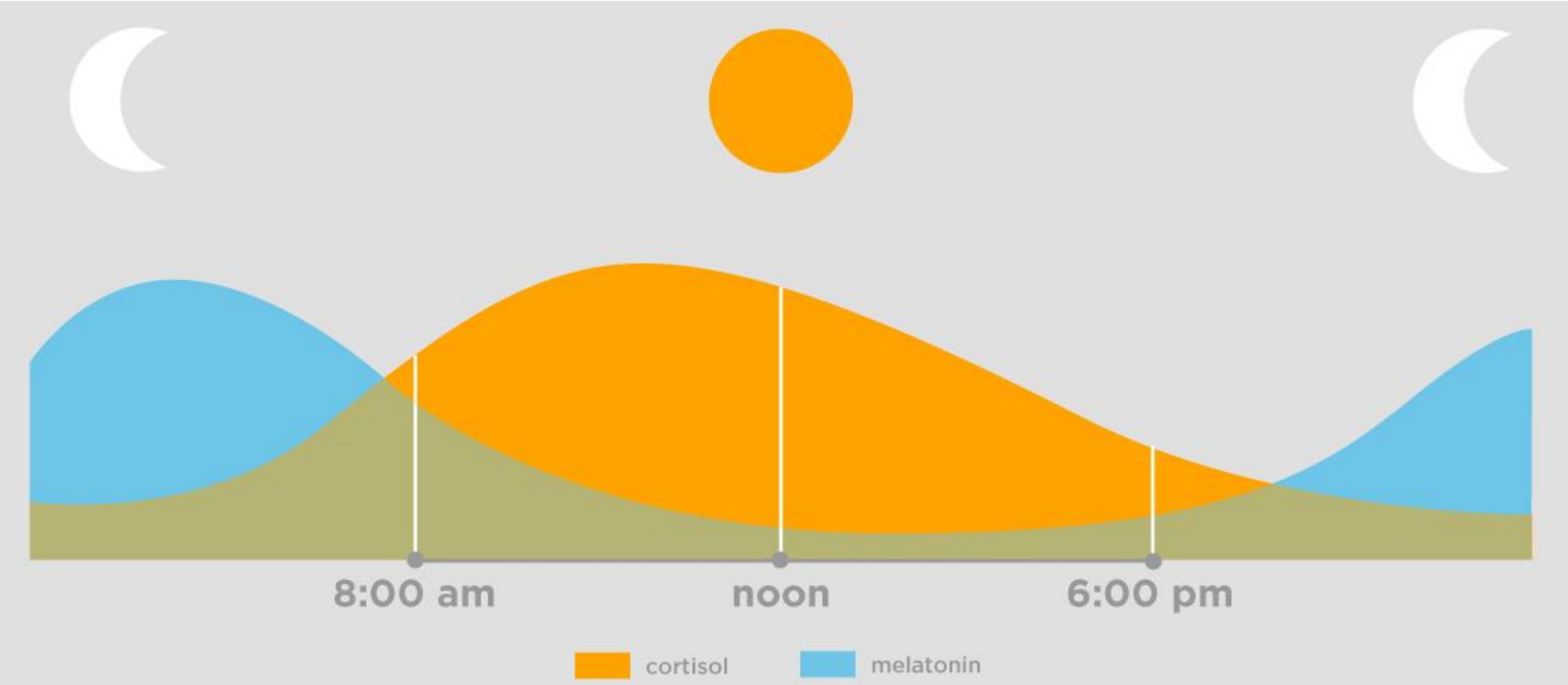
- Warm light level
- Melatonin production

Light has direct impact on

wakefulness and sleep
emotion
hormone release
concentration

Light has indirect impact on

immune system
recovery
memory
behavior



Since the year 1879 artificial light

Since the year 2000

we spend **90% daytime indoor**

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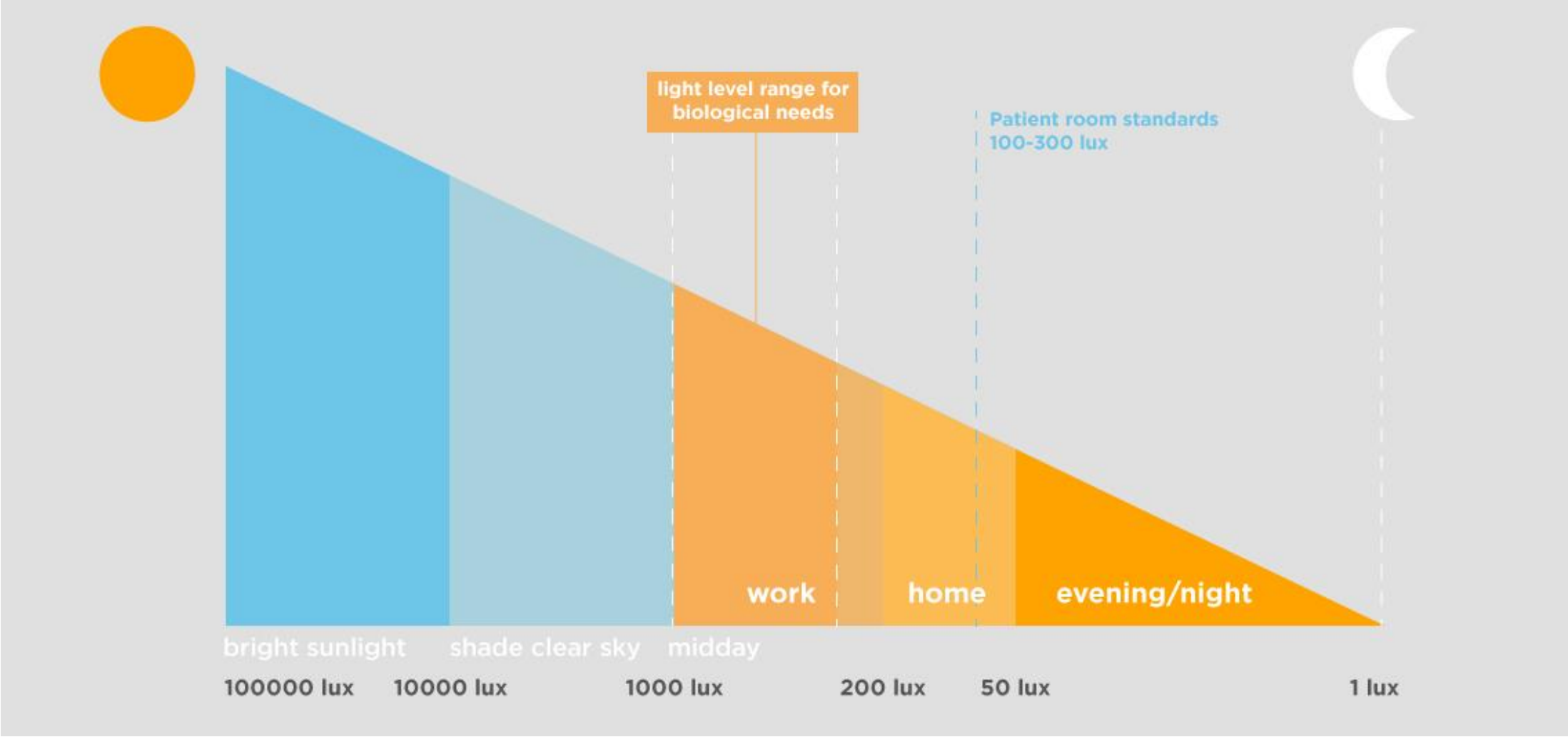
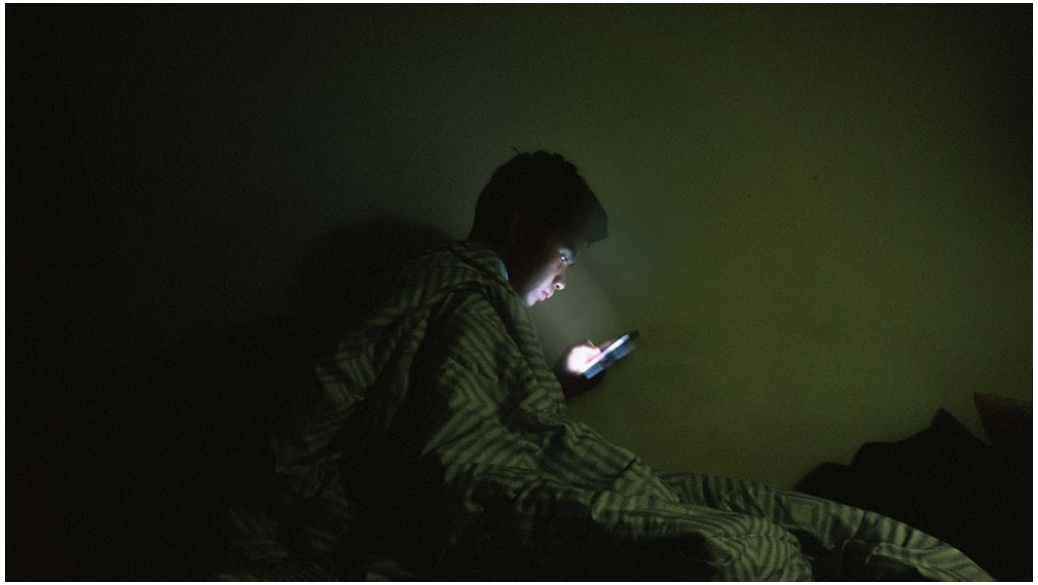
Outdoor light ↔ artificial light



Lighting solution where is there is not much light on your eyes. This can have an impact on our health and wellbeing.

Too much light at the wrong time disturbs our sleep rhythm.



Night interruption

Light suppresses the Melatonin and prepares the body to wake up.

Phase shift

The day after your body expects at the interrupted time light and prepares the body upfront. This means a phase shift in your sleep pattern.

Consequences

33% reports dissatisfaction with sleep on weekly basis (6,5h iso 8h)

tiredness is linked to a huge amount psychological effects

links with medical effects

Myopia

…

Human Centric Lighting **balances** visual, emotional and biological benefits of lighting for humans.

When the body and eye is exposed to light it undertakes a wide range of actions

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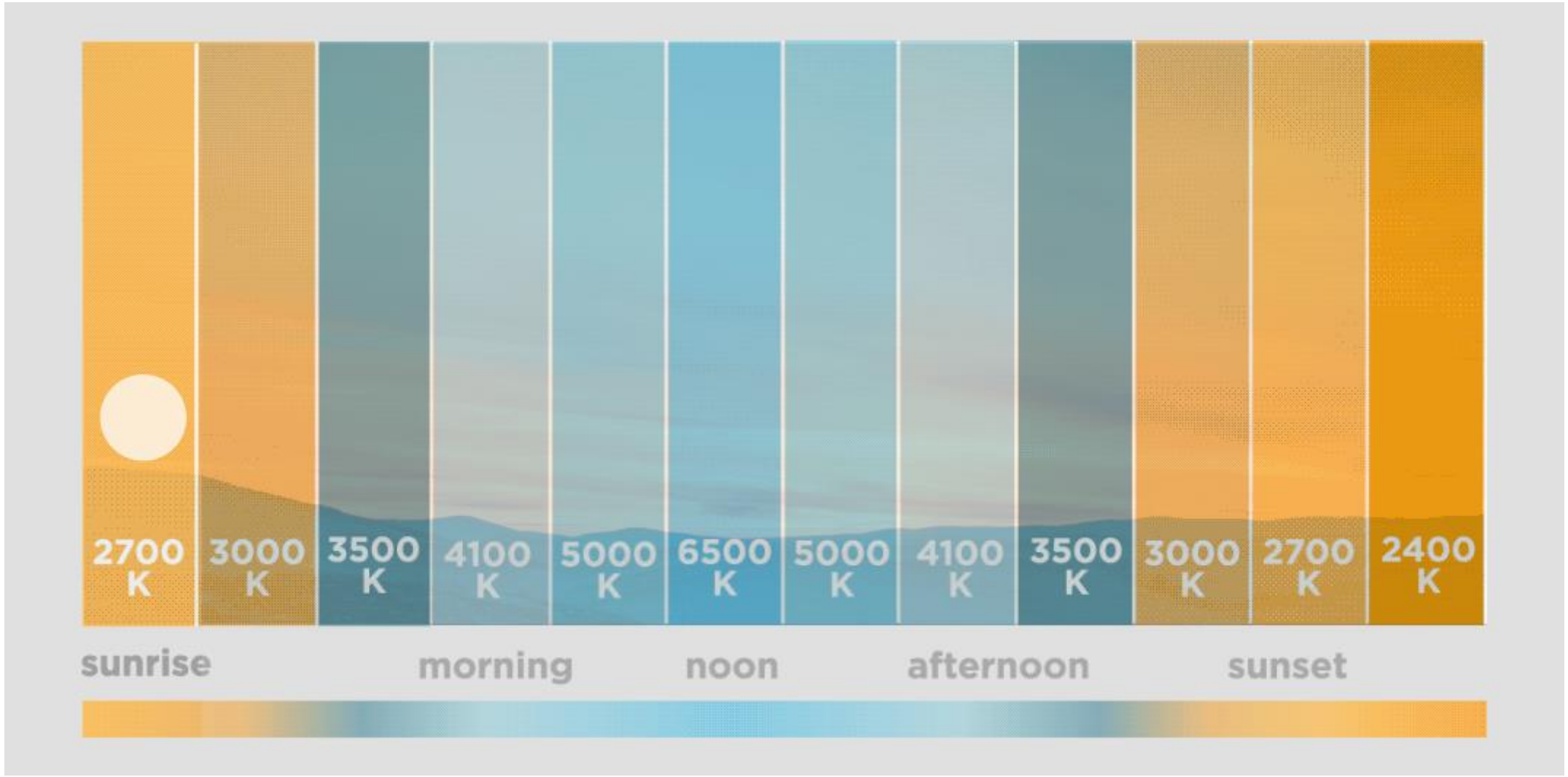

MEDI

Melanopic Equivalent Daylight Illuminance (D6500K)

Lux on the eye x MRatio

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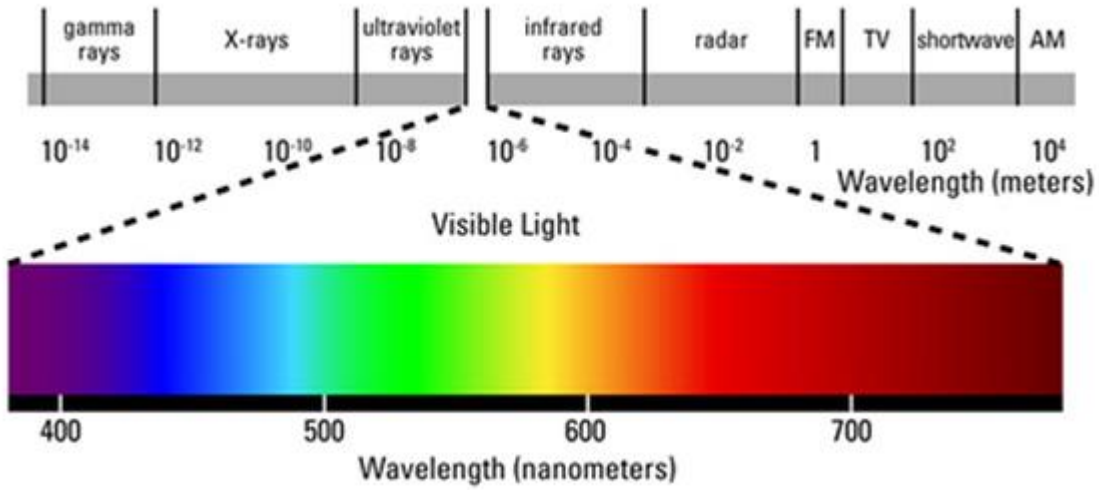
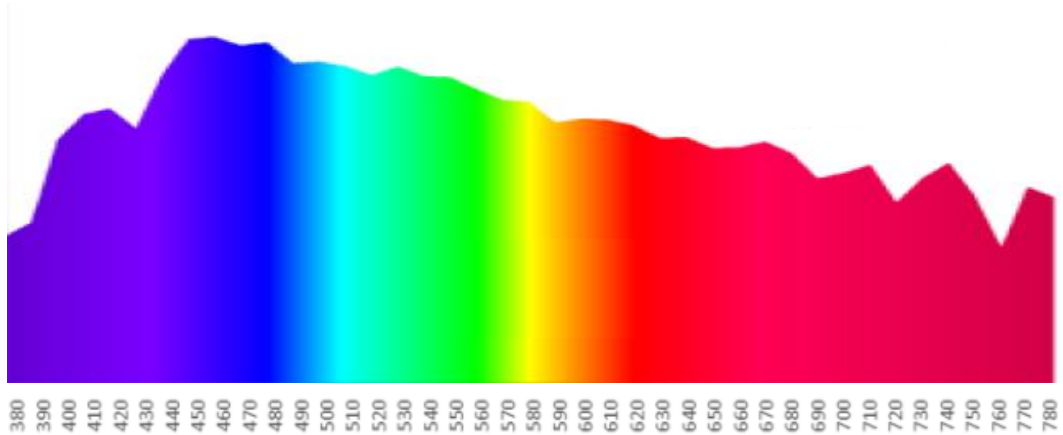
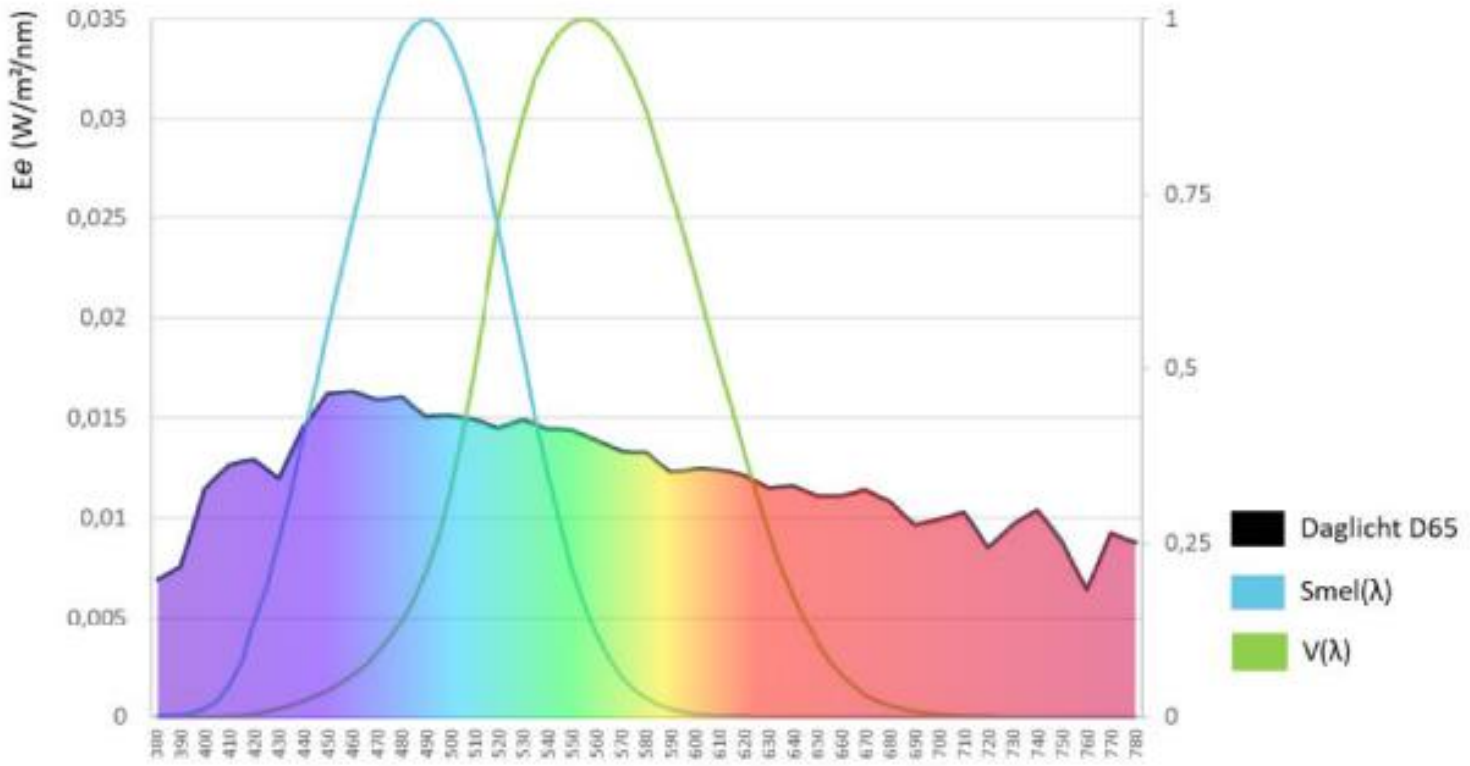


Visible light



Sunlight spectrum 6500K



Photopic (visual)

Melanopic (non visual)

Sunlight 6500K

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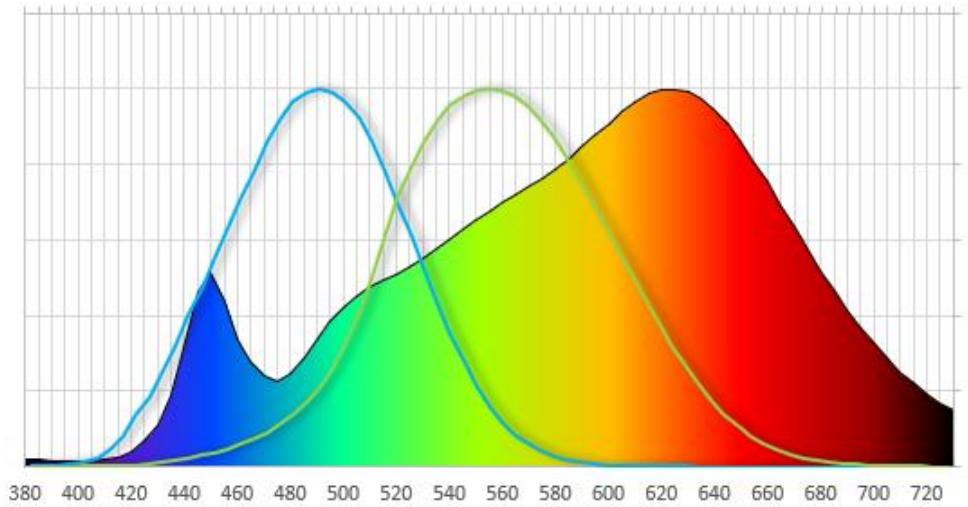
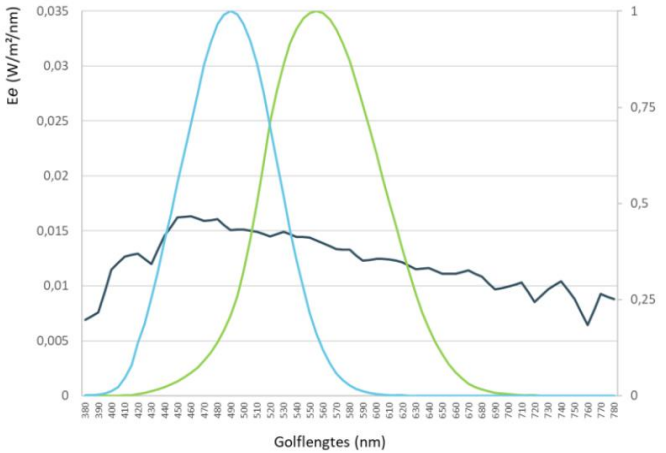


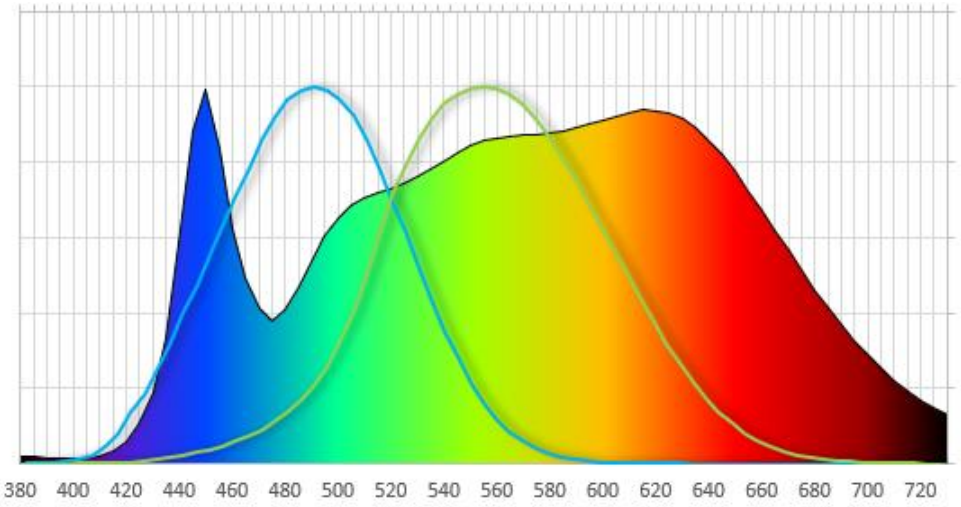
MRatio reference

Sunlight spectrum 6500K

MRatio : 1



MRatio 3000K : 0,55



MRatio 4000K : 0,75

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Office lighting EN 12464-1

work area 500 lux

UGR < 19

Wall 150 lux

MEDI

Lux on the eye combined with spectrum

Work area 500 lux

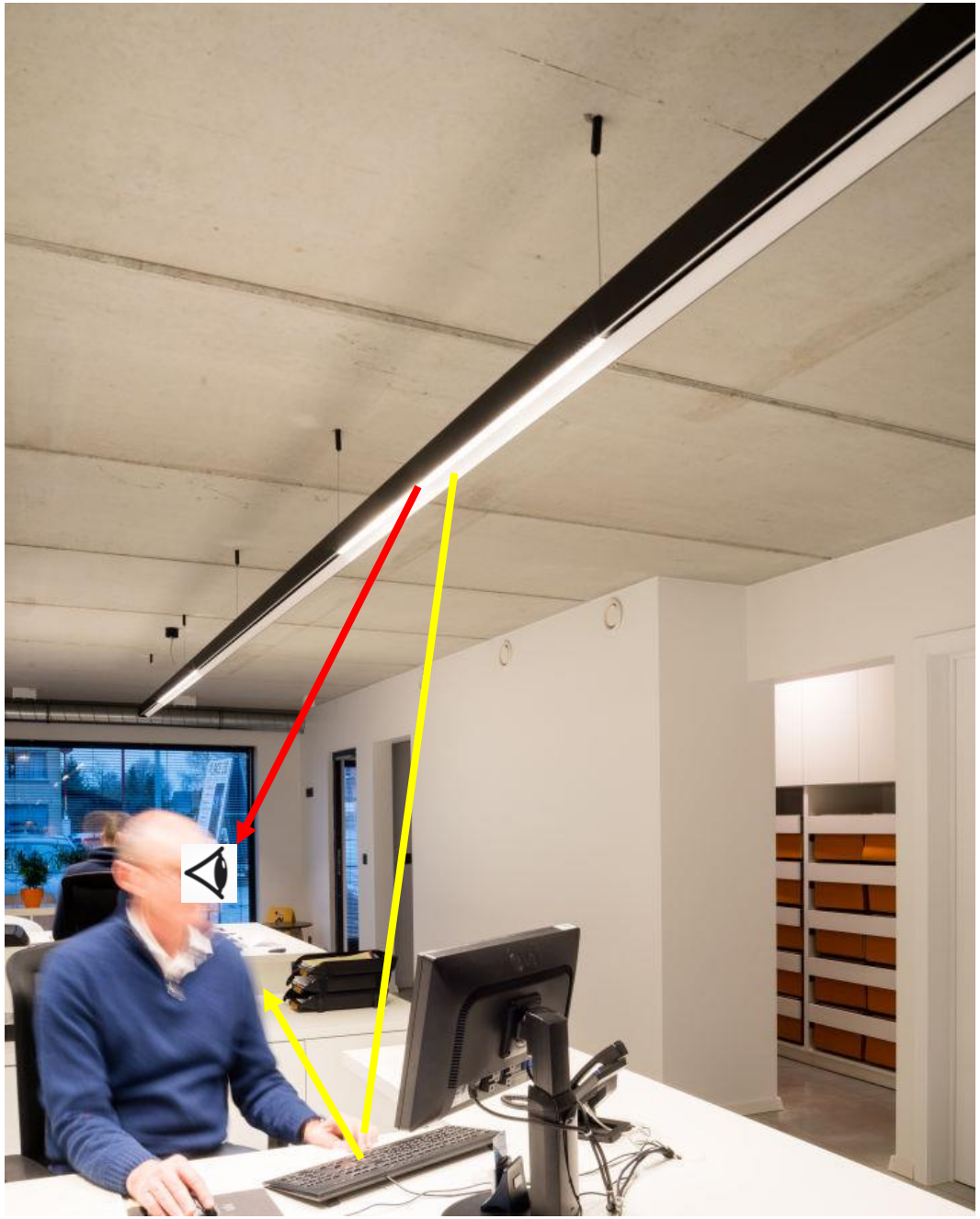
160 Lux on eye

MRatio 3000K 0,55

160 x 0,55 = 88 equivalent melanopic lux

MRatio 4000K 0,75

160 x 0,75 = 120 equivalent melanopic lux



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INTERNATIONAL WELL BUILDING INSTITUTE™

LIGHT FEATURES

FEATURE 53
Visual lighting design
VIEW

FEATURE 54
Circadian lighting design
VIEW

FEATURE 55
Electric light glare control
VIEW

FEATURE 56
Solar glare control
VIEW

FEATURE 57
Low-glare workstation design
VIEW

FEATURE 58
Color quality
VIEW

FEATURE 59
Surface design
VIEW

FEATURE 60
Automated shading and dimming controls
VIEW

FEATURE 61
Right to light
VIEW

FEATURE 62
Daylight modeling
VIEW

FEATURE 63
Daylighting fenestration
VIEW

FEATURE P2
Light at night
VIEW

FEATURE P3
Circadian emulation
VIEW

PART 2

Melanopic Light Intensity in Living Environments

In all bedrooms, bathrooms, and rooms with windows, one or more fixtures provide the following:

a. During the daytime, 200 or more equivalent melanopic lux as measured facing the wall in the center of the room 1.2 m [4 ft] above the finished floor. The lights may be dimmed in the presence of daylight, but are able to independently achieve these levels.

b. During the nighttime, lights provide not more than 50 equivalent melanopic lux (to the extent allowable by code) as measured 0.76 m [30 inches] above the finished floor.

PART 3

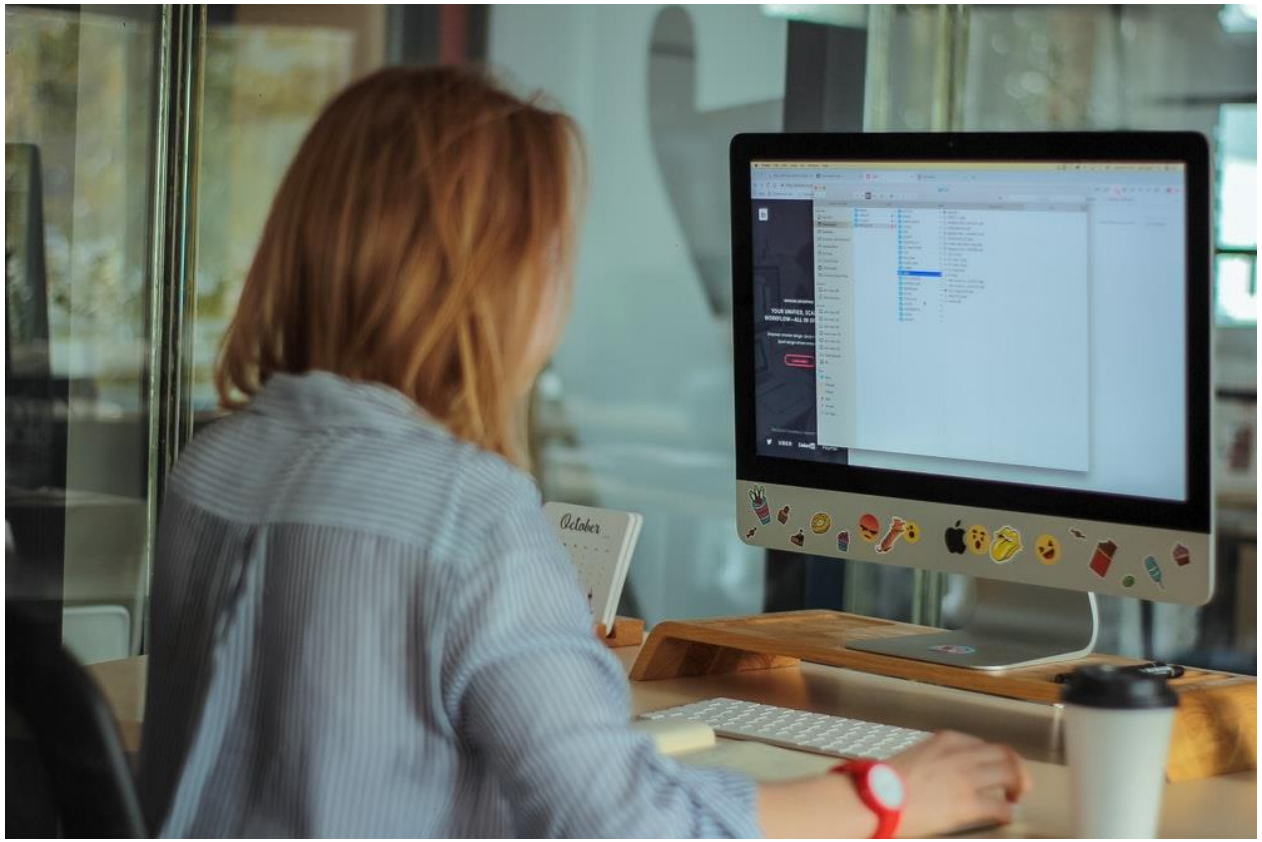
Melanopic Light Intensity in Breakrooms

Workplaces where employees spend most of their time in spaces with light levels limited by work type (such as restaurant servers or hospital ward workers) have break rooms which meet the following requirement:

a. Lights provide a maintained average of at least 250 equivalent melanopic lux as measured on the vertical plane facing forward at surfaces 1.2 m [4 ft] above finished floor. The lights may be dimmed in the presence of daylight, but are able to independently achieve these levels.

WELL Standard

250 MEDI (32 year old)



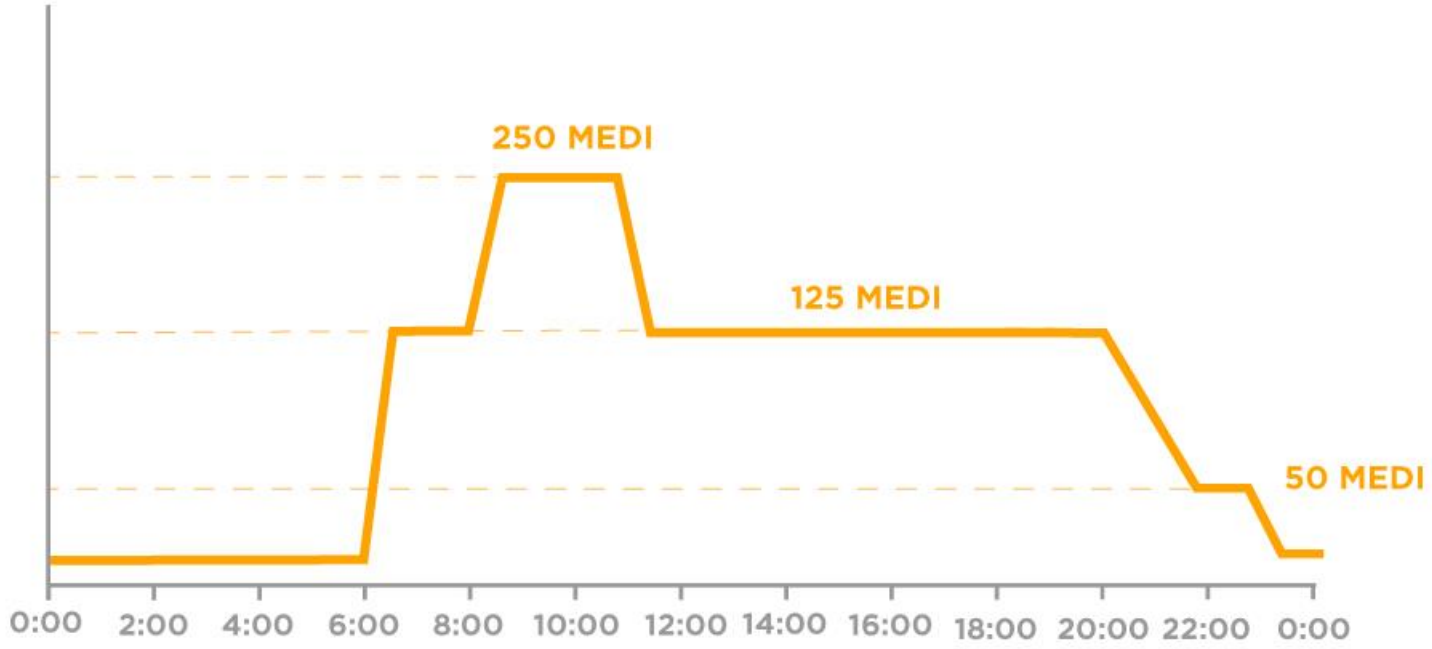
Elderly people MEDI x 2

narrower pupil

yellowing lens

250 MEDI during complete day?

Boost 2h before noon is required.

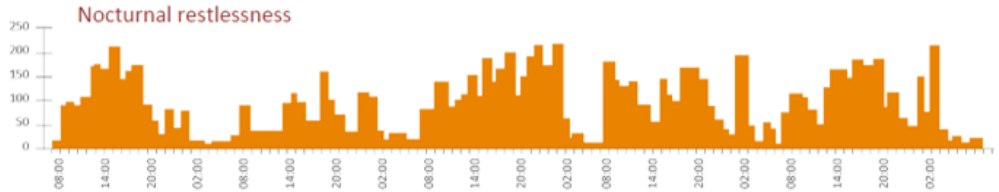


White, M. D., Ancoli-Israel, S. & Wilson, R. R. Senior living environments: evidence-based ligh&ng design strategies. HERD 7, 60-78 (2013). 2 - Riemersma-van der Lek, R. et al.Effect of Bright Light and Melatonin on Cogni&ve and Noncogni&ve Func&on in Elderly Residents of Group Care Facili&es: A Randomized Controlled Trial. JAMA: The Journal of the American Medical Associa.on299, 2642-2655 (2008). 3 Mishima, K., Okawa, M., Shimizu, T. & Hishikawa, Y. Diminished melatonin secre&on in the elderly caused by insufficient environmental illumina&on. J. Clin. Endocrinol. Metab 86, 129-134 (2001). Santhi, N. et al. The spectral composi&on of evening light and individual differences in the suppression of melatonin and delay of sleep in humans. J. Pineal Res53, 47-59, doi:10.1111/j.1600-079X.2011.00970.x [doi] (2011). Corbee, R. W., Middleton, B. & Arendt, J. An hour of bright white light in the early morning improves performance and advances sleep and circadian phase during the Antarc&c winter. Neurosci. LeM 525, 146-151, doi:S0304-3940(12)00854-3 [pii];10.1016/j.neulet.2012.06.046 [doi] (2012).

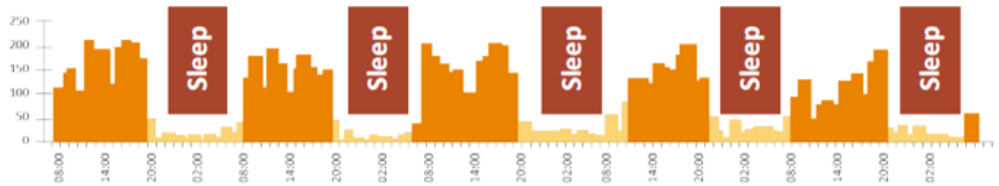
Test case

Demented elderly

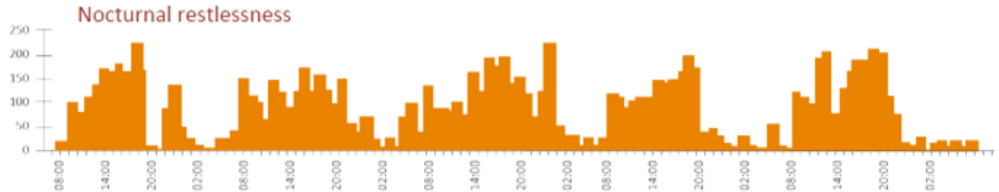
Before



After 4 weeks of extra light



After another 4 weeks without extra light



DOI: 10.1016/S0006-3223(97)89928-3

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How can we increase the MEDI?

How can we increase the MEDI?

Light intensity

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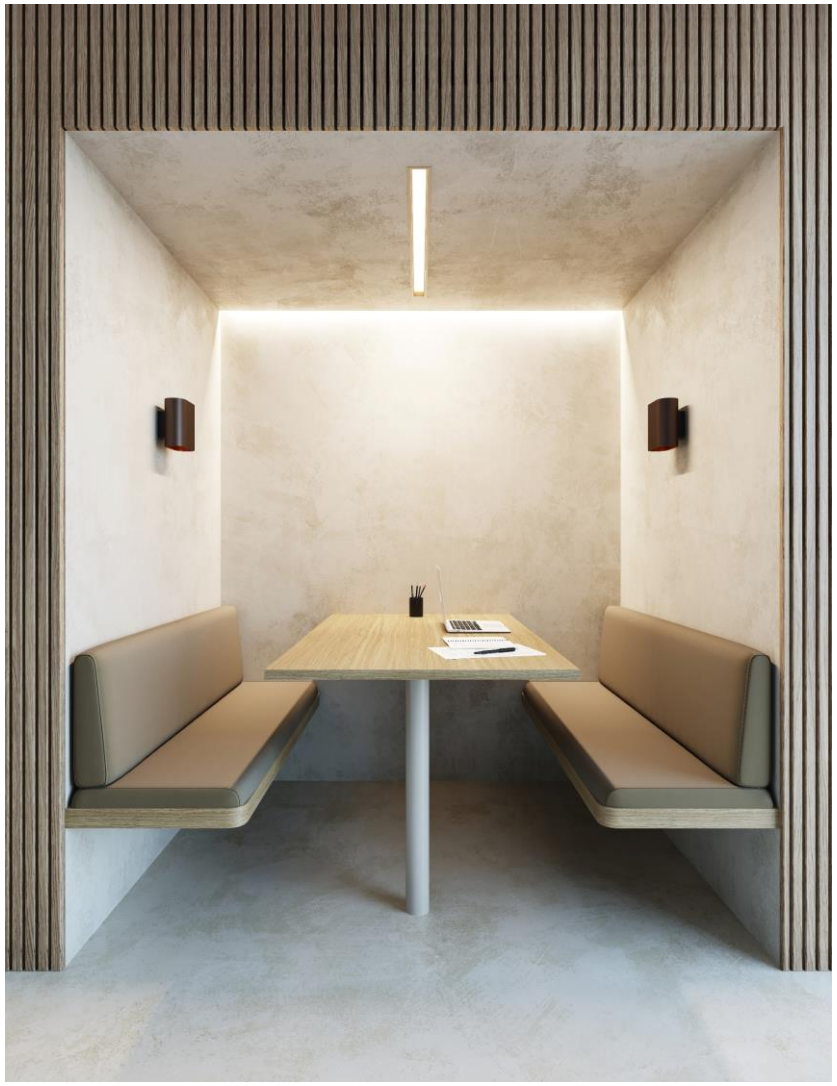
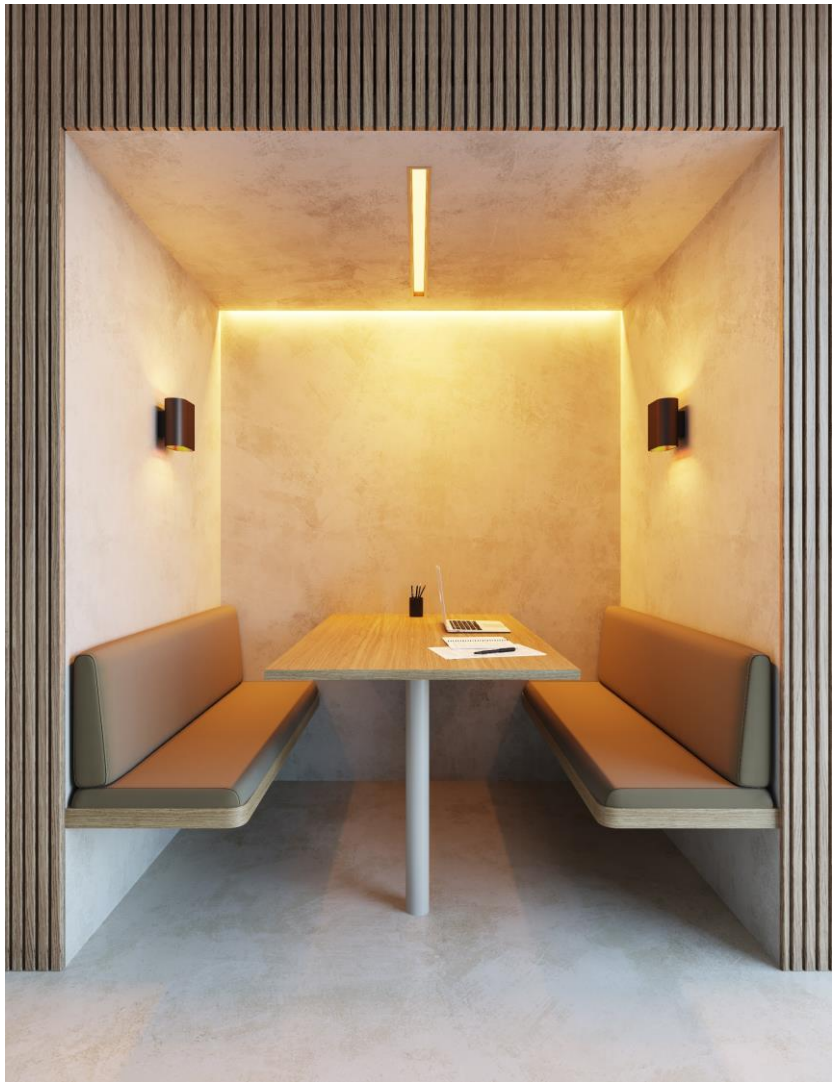
How can we increase the MEDI?

Light intensity + colour temperature

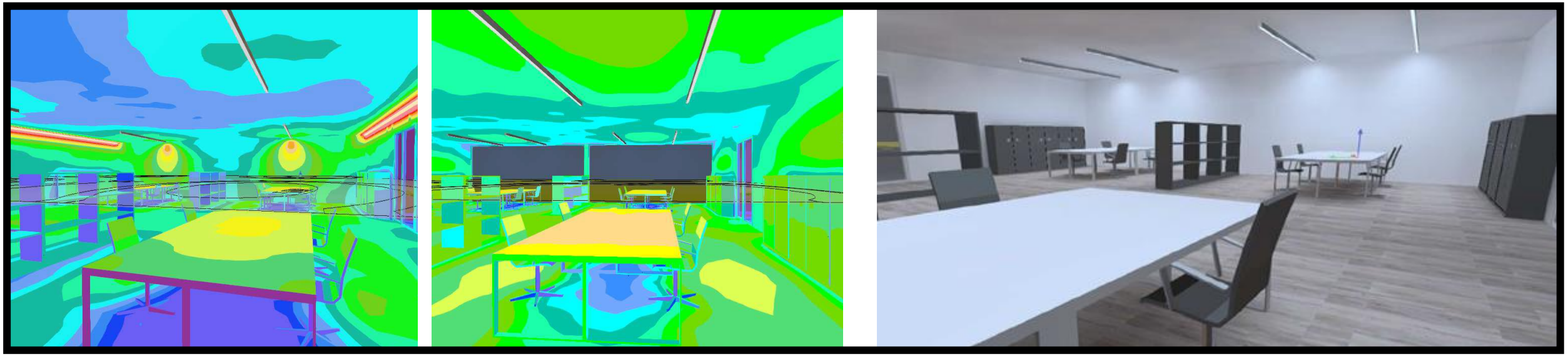




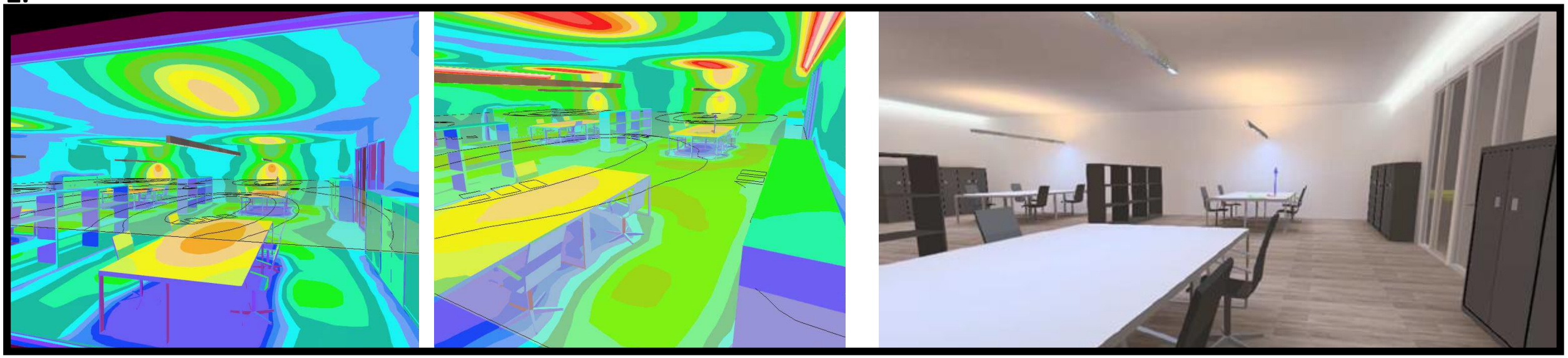
How can we increase the MEDI?

1.

Light distribution



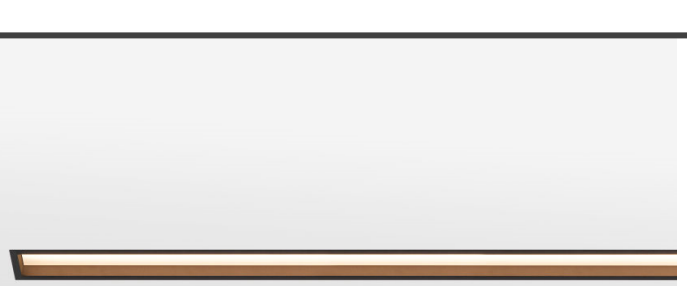
2.



How can we increase the MEDI?

Control

LIGHTING



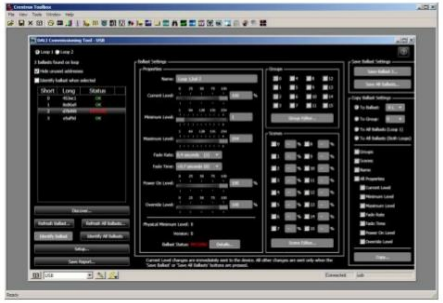
SLD50

LEDLINE 2700-6500K

DALI driver

CONTROL

DALI



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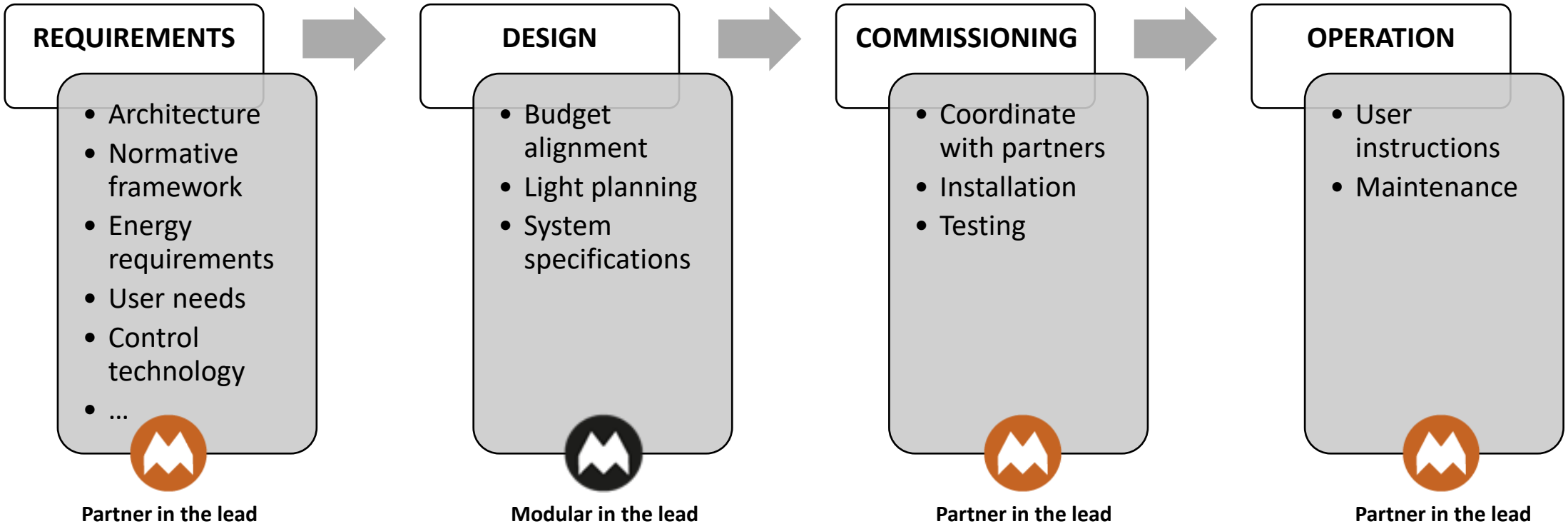
How can we increase the MEDI?

Lighting design

Implementation of a HCL concept requires a partnership



Pricing

PROFILE	SLD50 poly in – 3000mm
MOUNTING	suspended
COLOR	black struc

Configuration 1 — 100%

LIGHT (down)	1x linear LED (6) 3000K
	4x eyeball 3000K

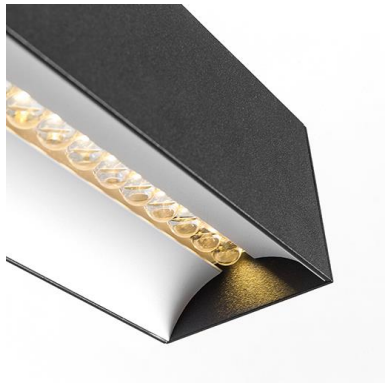
Configuration 2 — 129%

LIGHT (down)	1x linear LED (6) 3000K
	4x eyeball 3000K
LIGHT (up)	**LED strip 2000lm/m 3000K**

Configuration 3 — 146%

LIGHT (down)	**1x linear LED (6) 2700-6500K**
	4x eyeball 3000K
LIGHT (up)	**LED strip 3600lm/m 3000K**

HCL propositions



Drupl
direct/indirect

Como corner
indirect

SLD75
direct/indirect

SLD50
direct/indirect
TW 3000lm
uplight 3600lm

SLD50 naked
direct/indirect
Up/downlight 3600lm

SLD50 high
direct/indirect
TW 3000lm
uplight 3600lm

Flat moon
direct/indirect

Shellby
direct

Placebo
direct/indirect
new shades

Duell
indirect
new colours

Trapz
indirect
new colours

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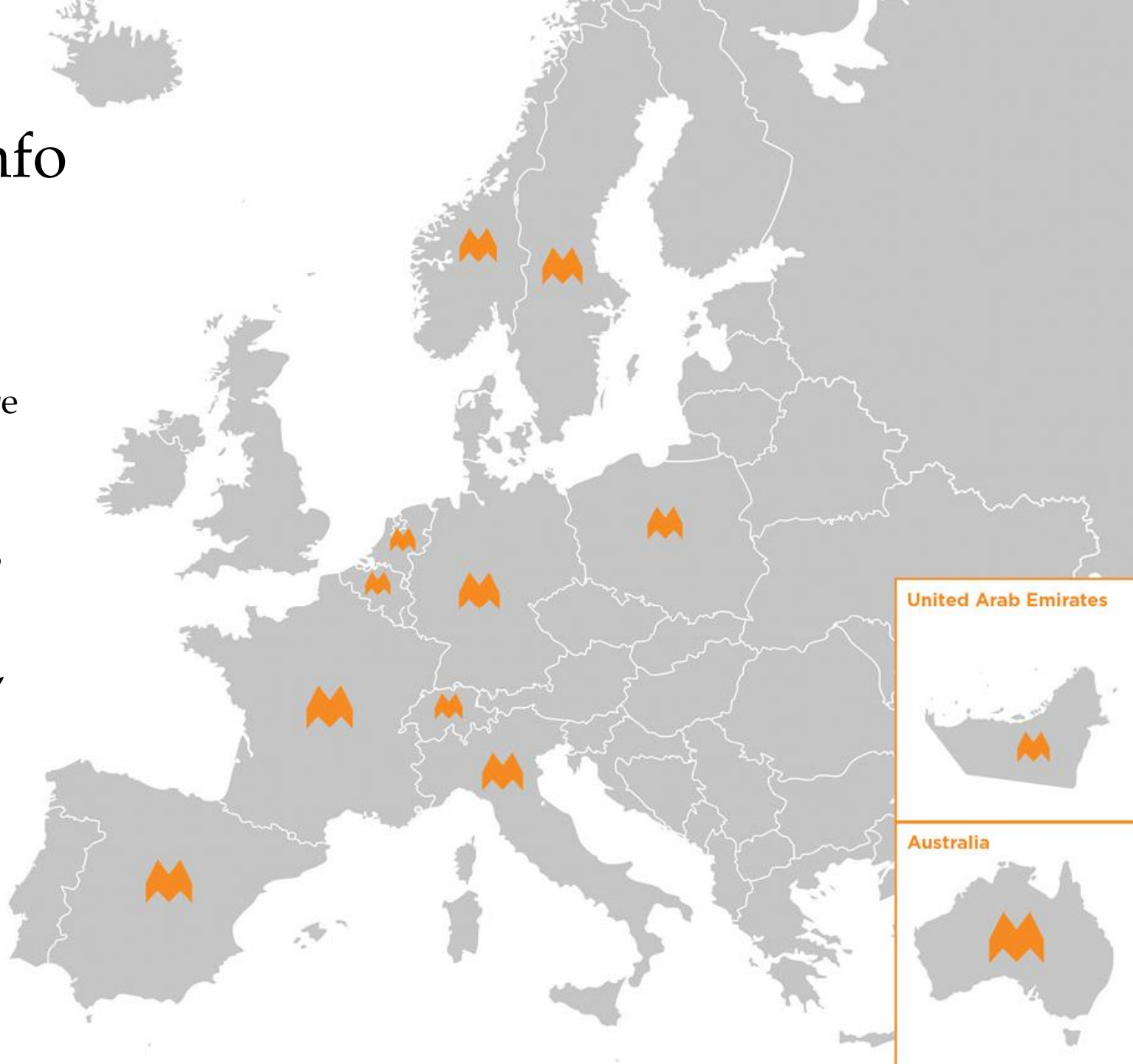
Contact us for more info

Want to specify a HCL project?

Your Modular Account Manager or Customer Service representative is there to help!

2nd line project support by Modular's HCL ambassadors

Andreas, Anjelica, Frederik, Job, Kamil, Lars, Matthias, Nancy, Nils, Robbert, Sylvie, Tom, Yannick



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Human Centric Lighting

The right light with the right spectral content at the right time

HCL is the closest technology that has come to bring the natural world indoors.

Mental and physical wellbeing.

Appropriate lighting by evening leads to superior, restful sleep.

Correct lighting improves mood, which in turn leads to sharper concentration and memory retention.

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