



\* intra lighting

# Switch to LED

# Invention of blue LEDs wins physics Nobel

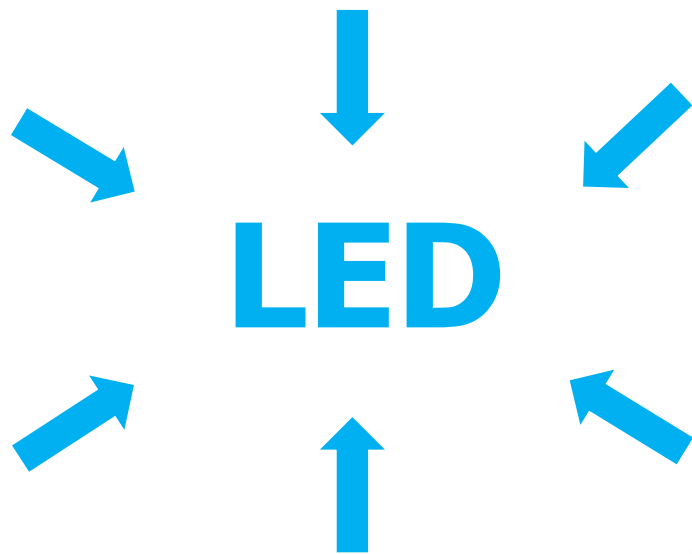
**Befitting of Alfred Nobel's spirit the award goes to the invention that is of most benefit for the human kind.**

The Royal Swedish Academy of Sciences has awarded Isamu Akasaki, Hiroshi Amano and Shuji Nakamura the Noble Prize "for the invention of efficient blue light-emitting diodes which has enabled bright and energy-saving white light sources".

**Congratulations!**



**LED**



# Why LED?



Save on energy / better efficiency



Save on maintenance / longer lifetime



Save on hazardous substances / no mercury



Save on overall investment / less energy and maintenance cost

# LED vs traditional light source

Comparison due to:

- Catalogue data
- Lumen output
- Light colour
- Lifetime

# LED vs traditional light source





## Lumen output - metal-halide discharge lamps

### METAL HALIDE DISCHARGE LAMPS / HALOGENMETALLDAMPFLAMPEN

#### Single-ended compact metal halide discharge lamps with plug-in base / Einseitige kompakte Halogenmetalllampen mit Stecksockel

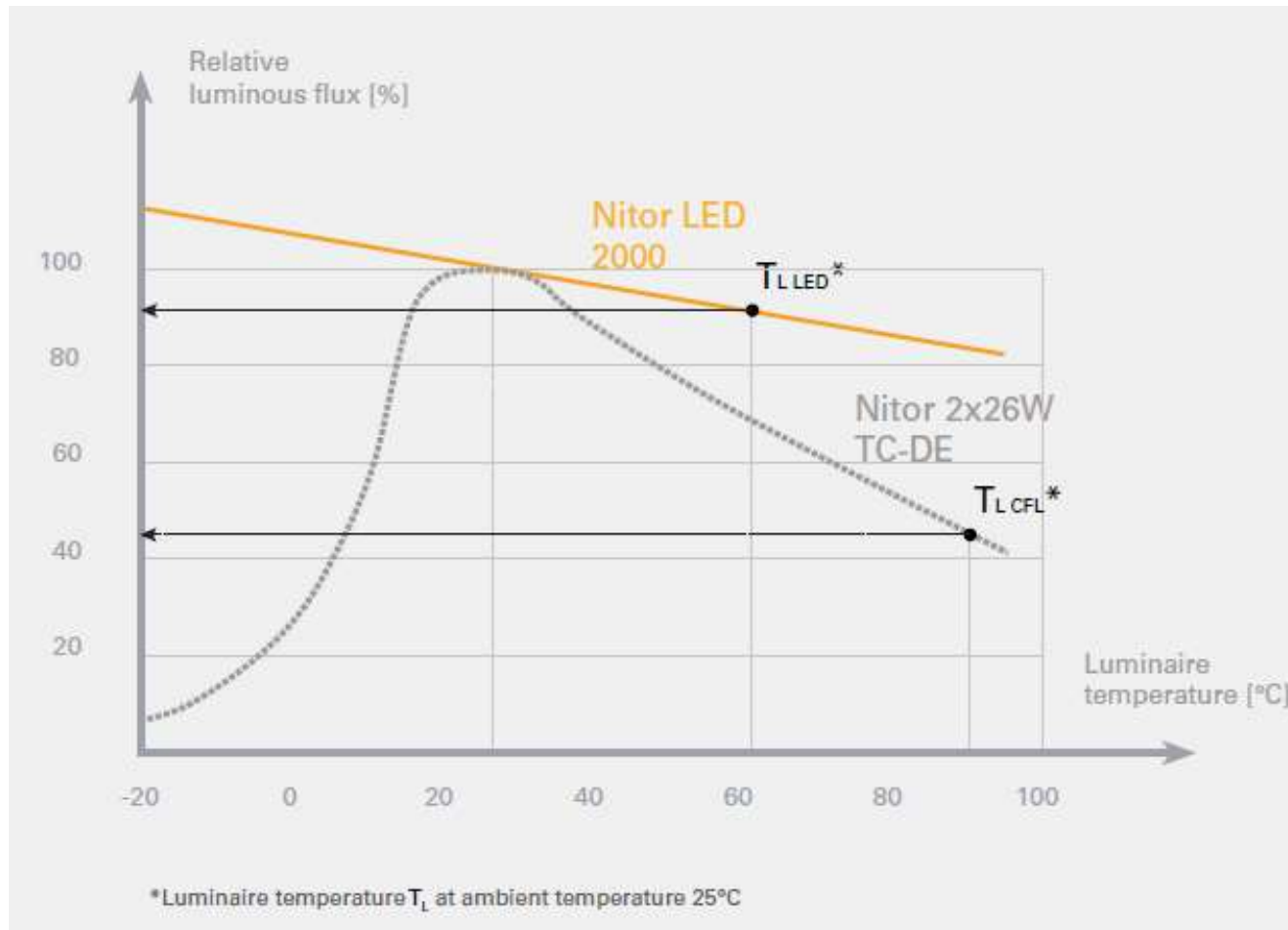
Rated voltage: appropriate control gear on 230V; burning position: universal

Nennspannung: entsprechende Vorschaltgeräte mit 230 V; Brennlage: universal

Type Typ	Lamp type Lampen Typ	Power Leistung [W]	Socket Sockel	Lumen output Lichtausstrahlung [lm]	Efficiency Effizienz [lm/W]	Ra index Ra index	Ra class Ra Klasse	Colour T Farbtemperatur [K]	Dimensions Abmessungen d [mm] / l [mm]	Average mortality Durchschnittliche Lebensdauer [h]
 HIT-CRI	<b>Philips CDM-TM</b>	20	PGJ5	1,650	82	85	1B	3043	17 / 52	6,000
		35	PGJ5	3,000	86	90	1A	3043	17 / 52	6,000
 HIT-CRI	<b>OSRAM HCI-TC</b>	20	G8.5	1,700	85	81	1B	3000	15 / 81	9,000
		35	G8.5	3,500	95	83	1B	3000	15 / 81	9,000
		35	G8.5	3,400	87	90	1A	4200	15 / 81	9,000
		70	G8.5	6,900	96	89	1B	3000	15 / 81	6,000
		70	G8.5	6,600	89	95	1A	4200	15 / 81	6,000
 HIT-CRI	<b>GE CMH-TC</b>	20	G8.5	1,650	83	80	1B	3000	15 / 85	12,000
		35	G8.5	3,400	97	80	1B	3000	15 / 85	10,000
		35	G8.5	3,200	91	85	1B	4,200	15 / 85	12,000
		70	G8.5	6,200	89	80	1B	3000	15 / 85	15,000
		70	G8.5	6,300	90	90	1A	4200	15 / 85	15,000
 HIT-CRI	<b>PHILIPS CDM-TC</b>	35*	G8.5	3,500	100	90	1A	3000	15 / 85	9,000
		35	G8.5	3,300	94	90	1A	4200	15 / 85	6,000
		70	G8.5	6,500	93	83	1B	3000	15 / 85	10,000
		70*	G8.5	7,300	104	90	1A	3000	15 / 85	12,000
		70	G8.5	5,900	84	90	1A	4400	15 / 85	6,000

# LED vs traditional light source

Lumen output

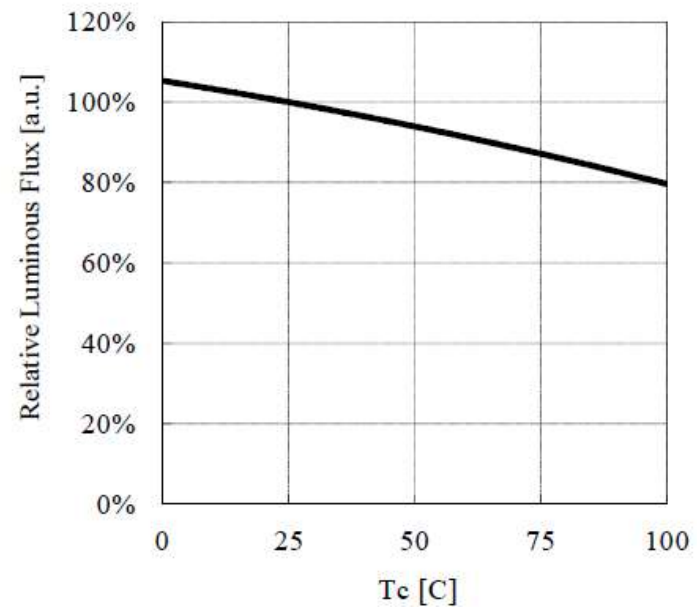




# Cold & hot COB lumen / system lumen output

Cold vs. hot lumens

I (A)	Tc=25°C	Tc=85°C	%
0,200	902,3	780,3	-13,5%
0,250	1082,8	936,4	
0,300	1257,2	1087,1	
0,350	1422,2	1229,9	
0,400	1575	1362	
0,450	1712,3	1480,7	
0,500	1831	1583,4	
0,550	1928,1	1667,4	
0,600	2000,5	1730	



# LED vs traditional light source

## Lifetime

Traditional light source:

Lifetime: when 50% of the light sources still works

LLMF - lamp lumen maintenance factor

LSF - lamp survival factor (lifetime B50)

*LED:*

*Time period (50.000h)*

*Rated luminous flux (L70)*

*Failure rate (F10)*

Forward current	tp temperature	L90 / F10	L90 / F50	L80 / F10	L80 / F50	L70 / F10	L70 / F50
250 mA	65 °C	23,000 h	35,000 h	49,000 h	>60,000 h	>60,000 h	>60,000 h
300 mA	65 °C	20,000 h	30,000 h	43,000 h	>60,000 h	>60,000 h	>60,000 h
350 mA	65 °C	17,000 h	26,000 h	36,000 h	55,000 h	58,000 h	>60,000 h

# Retrofit

## Why?

## When?

## Where?

Philips LED tube range



## The installer's **choice**

Installers have even more reasons to choose Philips LED tubes. As you'd expect from the world's leading name in lighting, our quality and attention to detail mean that we make your life safer and easier.

# Retrofit

## Why?

## When?

## Where?



### MASTER LEDtube T5 High Efficiency



HE

HF

Product type	LED	Rotatable end cap	Lumen output	Operation	Dimmable	Beam angle	CRI	Color temperature	Lifetime	Energy label	EOC 1 pcs (C)
MASTER LEDtube (HF)	W		lm			°		K	Hrs.		8718696
600mm HE 8W 830 T5 InstantFit	8	No	1000	HF	No	200	83	3000	50,000	A+	74323200
600mm HE 8W 840 T5 InstantFit	8	No	1050	HF	No	200	83	4000	50,000	A+	74325600
600mm HE 8W 865 T5 InstantFit	8	No	1050	HF	No	200	83	6500	50,000	A+	74327000
1200mm HE 16.5W 830 T5 InstantFit	16.5	No	2300	HF	No	200	83	3000	50,000	A+	74329400
1200mm HE 16.5W 840 T5 InstantFit	16.5	No	2500	HF	No	200	83	4000	50,000	A++	74331700
1200mm HE 16.5W 865 T5 InstantFit	16.5	No	2500	HF	No	200	83	6500	50,000	A++	74333100
1500mm HE 20W 830 T5 InstantFit	20	No	2800	HF	No	200	83	3000	50,000	A+	74335500
1500mm HE 20W 840 T5 InstantFit	20	No	3000	HF	No	200	83	4000	50,000	A++	74337900
1500mm HE 20W 865 T5 InstantFit	20	No	3000	HF	No	200	83	6500	50,000	A++	74339300

# Retrofit



Zakaj prenavljamo šolo?

Za koliko časa?

Za koga?

# Retrofit

- The lighting calculations can't be done
- No garanty, no waranty
- The price for huge projects is 1/3 of the price of wholesalers
- The normal replacement of 2 led bulbs retrofit is almost a new louminaire
- When the lamp is opened, at that time the problems are still comming. Then you realize that the conectors are broken, that the lamp can't be opened,...

## New luminaire

- The lighting calculations can be done
- 7 years warranty
- The price for huge projects is the same of the price of wholesalers
- Normal replacement of expiring parts
- Replacing parts available for all necessities
- New lamp, new story.



spots, downlights

COB

LED  
portfolio

PCB

Linear  
PCB

profiles



decorative,  
rectangular panels





**COB LED modules**

# COB LED modules

## Our selection



Citizen CLL 22-1205 Vf=36V

Cree CXA 1507 Vf=18V

Nitor/Narro 1200, Nitor kit 1200/2000

Pipes R XS, Deux Pieces, Eyen



Citizen CLL 32-1212 Vf=36V

Cree CXA 2530 Vf=36V

Nitor/Narro 2500-3800, Pipes S, Ergetic, Flott S

Nitor/Narro 2000



Citizen CLL 42-1818 Vf=36V

Pipes L, Flott L

# COB LED optics

Optics are usually made for specific COB. Change of COB results in different photometric data.



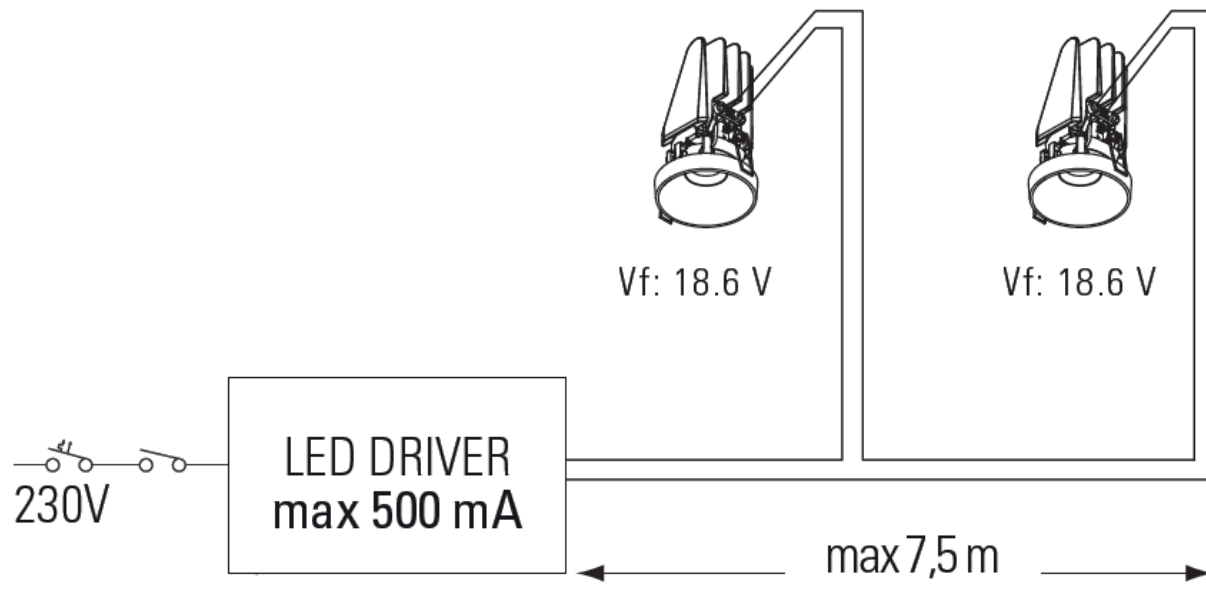


**Drivers**

# Drivers

To select optimum driver COB combination we need to know:

- no of COB connected to one driver
- forward voltage ( $V_f$ ) of COB
- driving current (mA)



## Multi-power concept



DC MAXI JOLLY US DALI B



**DC Operation range**  
**Tensione di utilizzo DC**  
DC 170 ÷ 280 V

[illegible]



# Linear LED modules

# High quality LED PCB light engines

High quality LED chip is not enough!

PCB material - CEM 3 thermal

High reflectance coating





# Drivers

Linear LED LV (SELV) drivers Philips Xitanium (built-in)

Power option: 36W and 75W

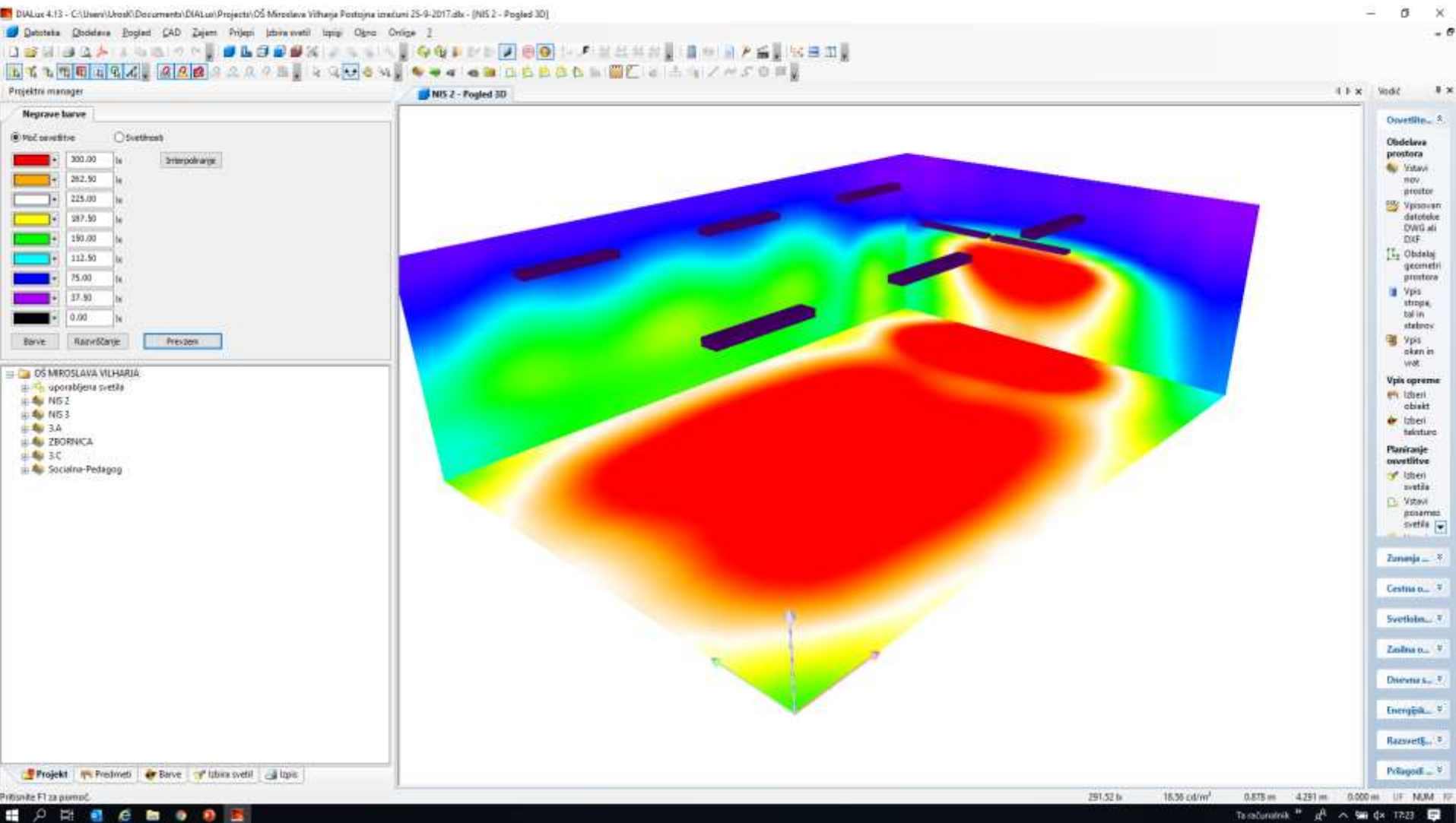
Fixed output, DALI (with touch-dim function)

Optional: EM kit with 1 or 3h autonomy

- final EM kit need to be selected
- tests on Kalis LEDplus before launch



# Lighting calculations



# Lighting calculations

O S MIROSLAVA VILHARJA

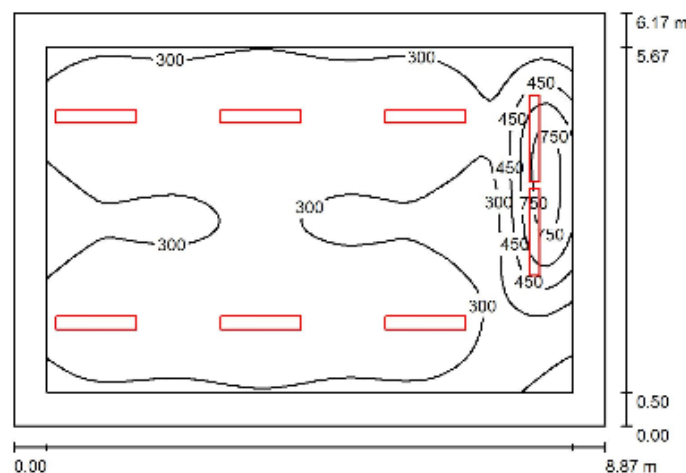


**DIALux**

26.03.2019

Obdelovalec (ka)  
Telefon  
Faks  
e-Mail

## NIS 2 / Enostranski izpis



Višina prostora: 2.800 m, Faktor vzdrževanja: 0.80

Vrednost v Lux, Merilna palica 1:80

Površina	$\rho$ [%]	$E_m$ [lx]	$E_{min}$ [lx]	$E_{max}$ [lx]	$E_{min} / E_m$
Osvetljena površina	/	359	110	856	0.306
Tla	20	290	111	531	0.382
Strop	70	58	38	68	0.650
Stene (4)	50	124	43	418	/

### Osvetljena površina:

Višina: 0.750 m  
Raster: 64 x 64 Točke  
Obrobje: 0.500 m

### Kosovnica svetilk

St.	Kos	Oznaka (F faktor korekture)	$\Phi$ (Svetilka) [lm]	$\Phi$ (Žarnice) [lm]	P [W]
1	6	INTRA LIGHTING 12197433401 216 PR 3260 lm 31W 840 FO 200x1200mm IP43 (1.000)	3298	4368	30.8
2	2	INTRA LIGHTING 12515411001 MIVA AS 1x28W T16 G5 EB (1.000)	1984	2600	30.0
Skupaj:			23755	31408	244.8

Specifična zaključna vrednost:  $4.47 \text{ W/m}^2 = 1.24 \text{ W/m}^2/100 \text{ lx}$  (Osnovna površina:  $54.73 \text{ m}^2$ )

# The following motivations for changing the light during learning emerged

- Support and structuring of learning activities
- Communication via the lighting
- Involvement of schoolchildren in decision-making
- Influence on activity level and behaviour
- Creation of a special atmosphere adapted to the activities
- Support for visual tasks and improved visual comfort

# Product recommendations

## Recessed

Demi RV SOP



Nitor RV PRO



Nitor RV Flat



Demi RV HMP



**5700**

The old-school solution



# Product recommendations

## Surface mounted

PRODUCTS

### Range

Demi C HMP

Demi C HMP 600x600/2



CONFIGURE

Demi C HMP 600x600/4



Demi C HMP 250x1200



### Lona

Actual anywhere



### Miva

All elementary





# Product recommendations for schools

## Suspended

### Kalis

*Absolutely universal*

NEW KALIS, AVAILABLE TO ORDER.



### Gyon

*More is more*

NEW GYON, AVAILABLE TO ORDER.



# Raziskovalni projekt "ALPHA Programme"

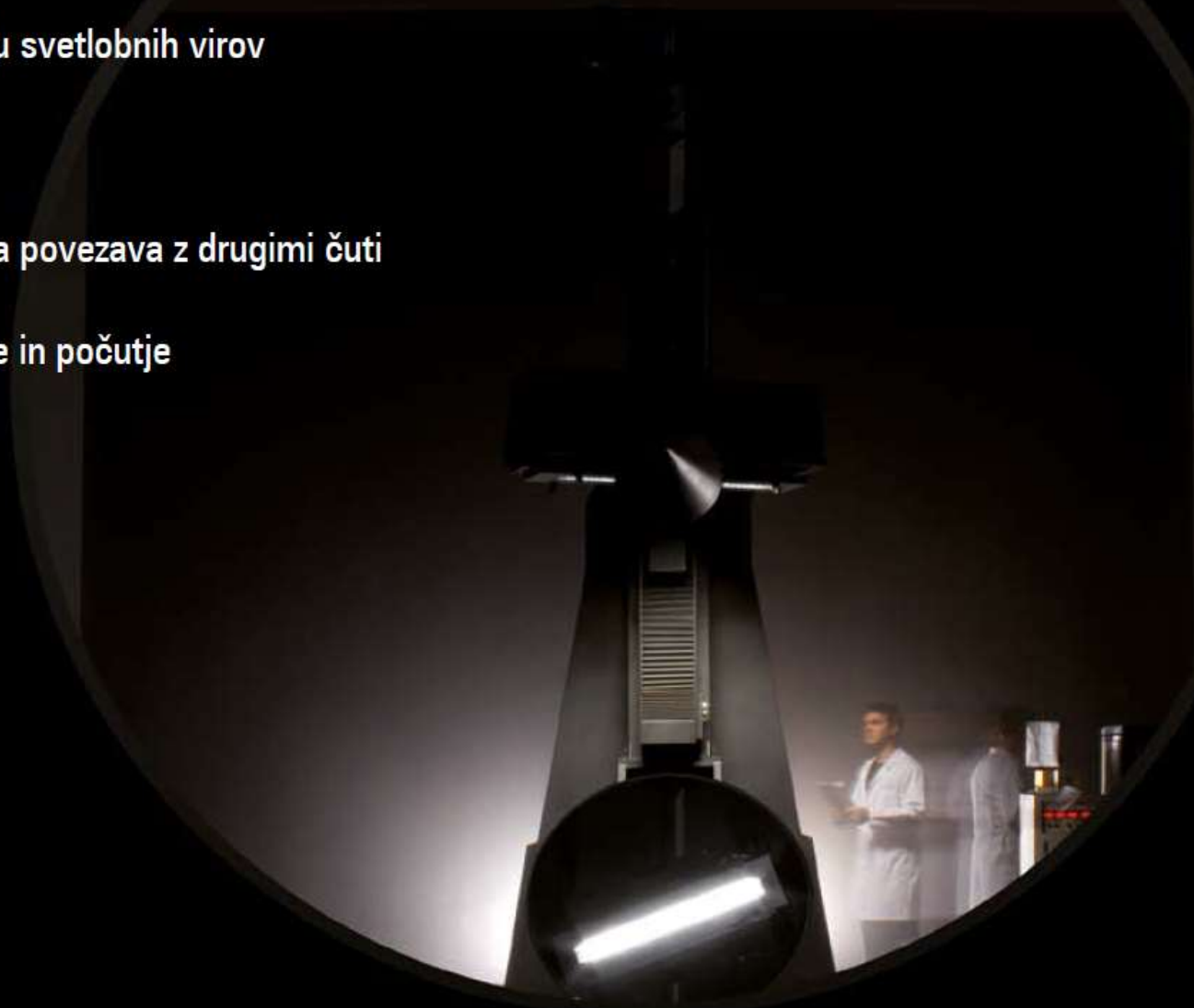
Delovna področja:

Zadnji trendi na področju svetlobnih virov

Energijska učinkovitost

Kakovost vida in njegova povezava z drugimi čuti

Vpliv svetlobe na zdravje in počutje







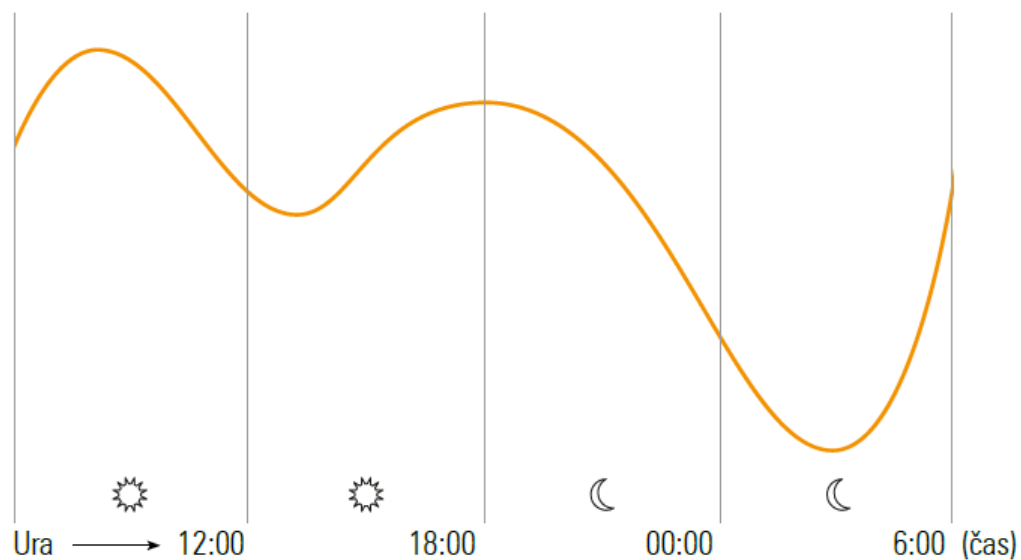
## **Naša notranja biološka ura**

Vsaka celica ima svojo notranjo  
biološko uro

“glavna ura” človeškega telesa se  
ravna po svetlobi

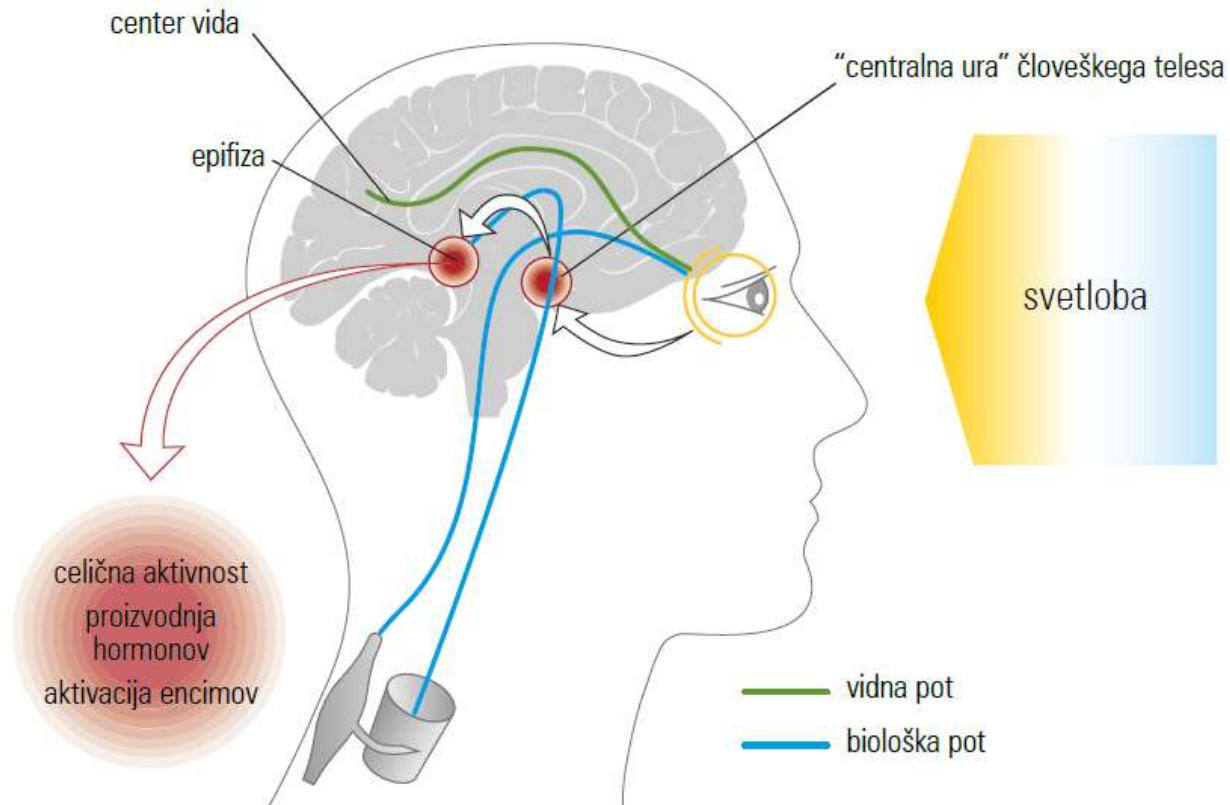
# Dnevni bioritem

Telo in um sta na višku svojih zmogljivosti okoli 10. ure dopoldan, svojo najnižjo točko pa dosežeta ob 3. uri ponoči



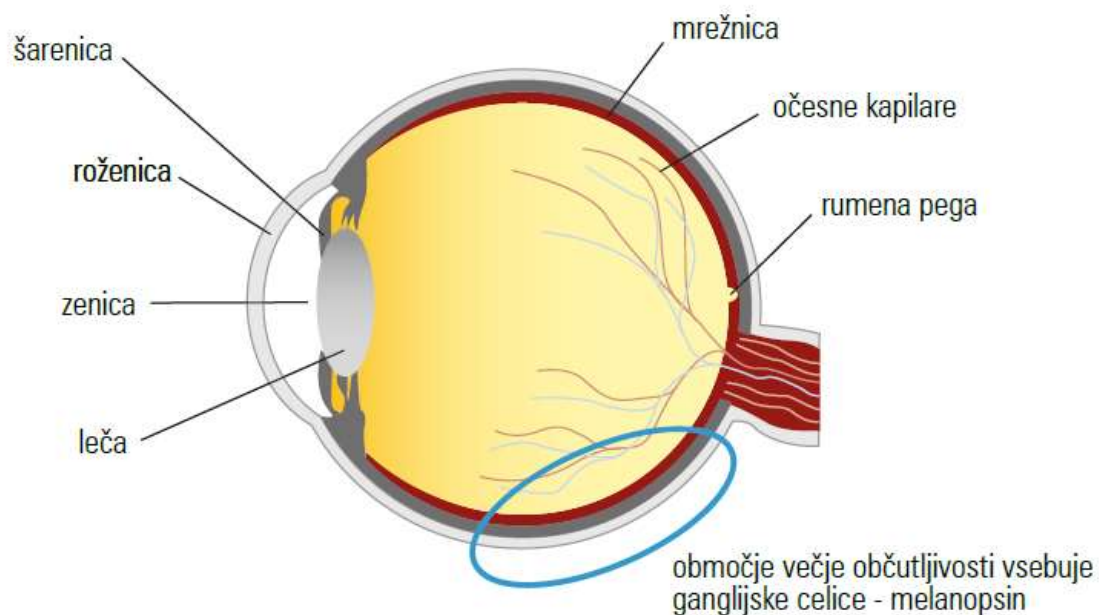
# Vidna in biološka pot svetlobe

“glavna ura”, centralni živčni sistem, ki upravlja celične aktivnosti



# Melanopsin – beljakovina, občutljiva na svetlobo

Aktivacija melanopsina je najintenzivnejša na modri svetlobi vidnega spektra z valovno dolžino približno 460 nanometrov

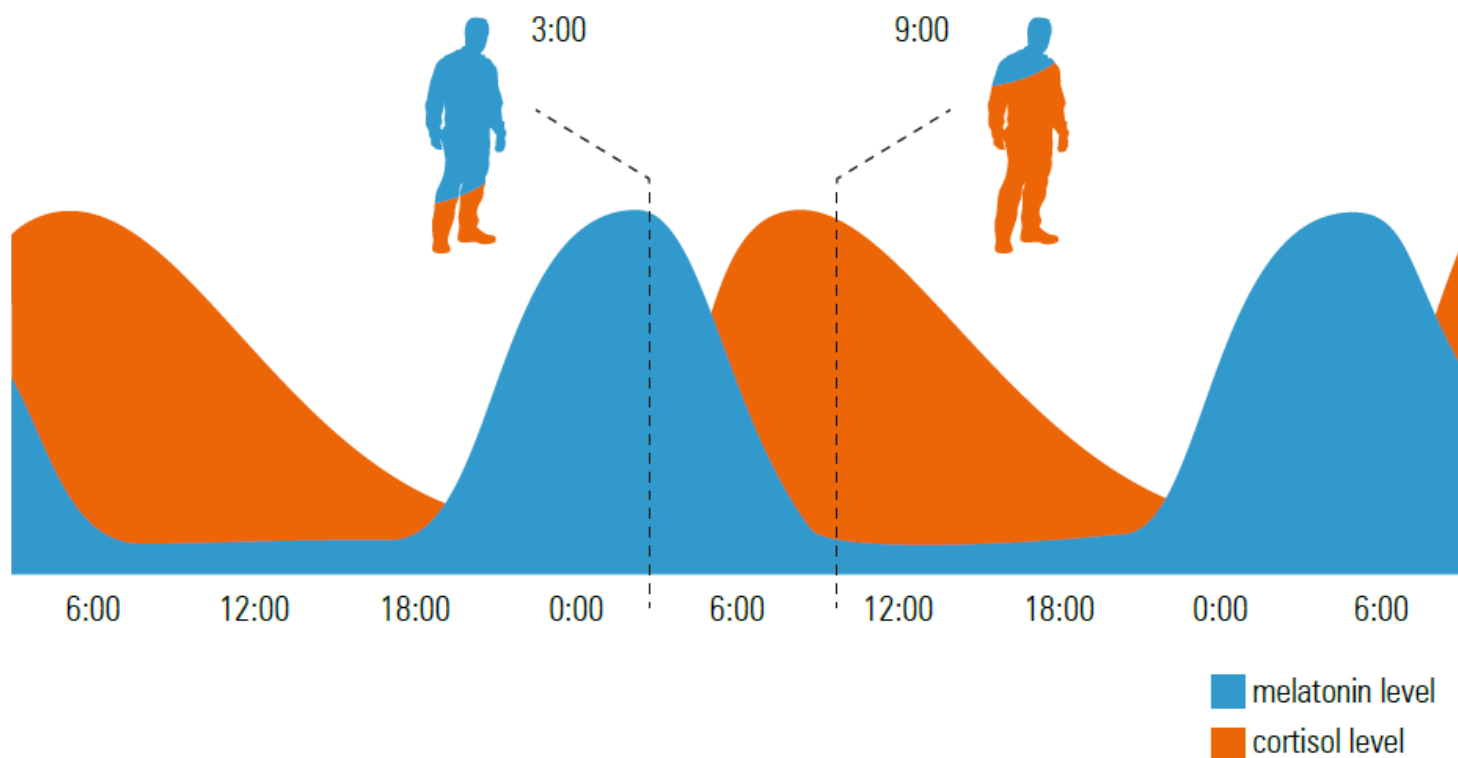


# Hormonski cikli

melatonin

kortizol

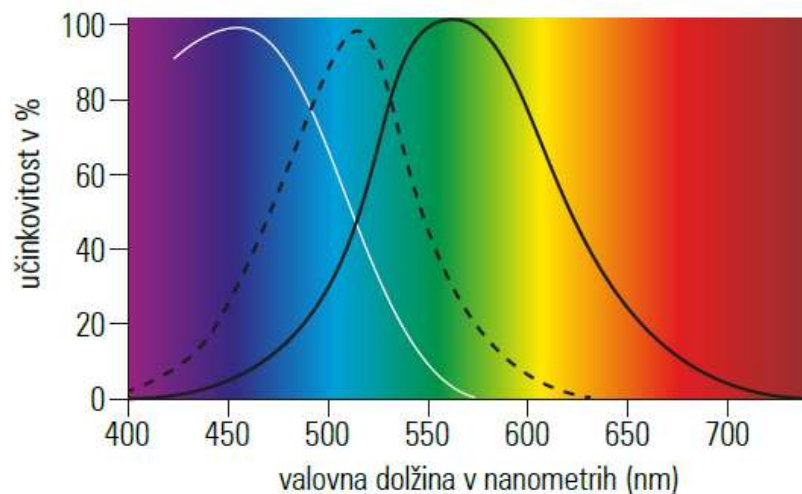
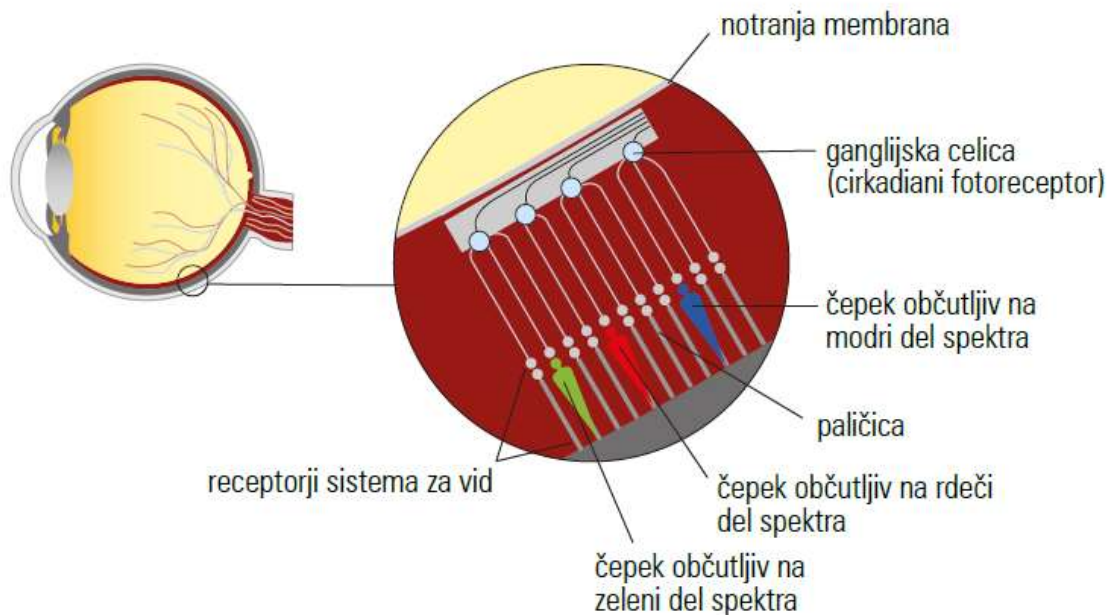
serotonin



# Receptorji sistema za vid

čepki

paličice





## TUNABLE WHITE



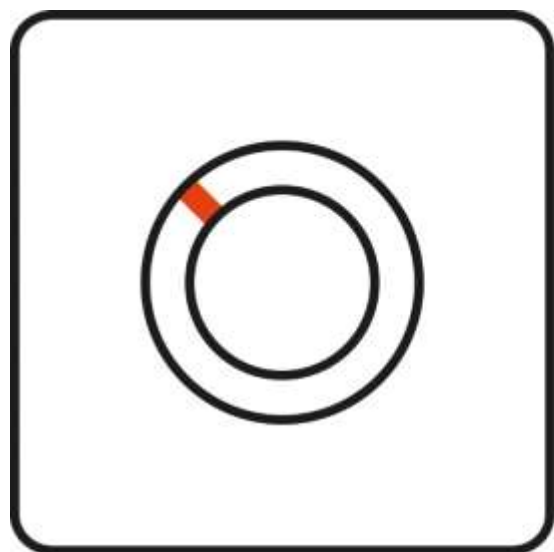
**Tunable White**





## TUNABLE WHITE





1800K < 2700K

**Dim** to **WARM**

