Technische Universiteit
Eindhoven
University of Technology

Onderzoek werpt nieuw licht op de zaak

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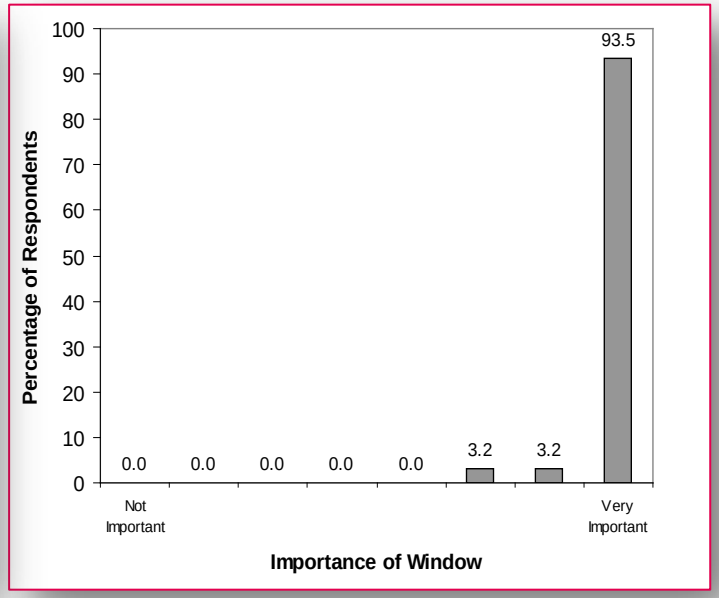
TU/e Department of the Built Environment
Unit Building Physics and Systems
Building Lighting group

LED event | 17 september 2015

Where innovation starts

Verlichting

- Lichtbron
  - Daglicht
  - Kunstlicht
- Lichtvoorkeur
- Mate van belangrijkheid



Verlichting

- Daglicht
  - Gewenst als verlichting van de werkplek
  - Hogere status dichterbij raam/meer ramen
  - Raamlocaties frequenter bezet
  - Imitatie, bijv. “daglichtlamp”
  - Huur daglicht-kantoren hoger

Verlichting

- Daglicht: waarom?
  - Spectrale samenstelling
  - Hoge verlichtingssterkte
  - Goede keurweergave
  - Uitzicht
  - …
- Geen daglichtwens bij thermisch/visueel discomfort
- Kunstverlichting niet uitgeschakeld bij voldoende daglicht




(ERCO)

Verlichting

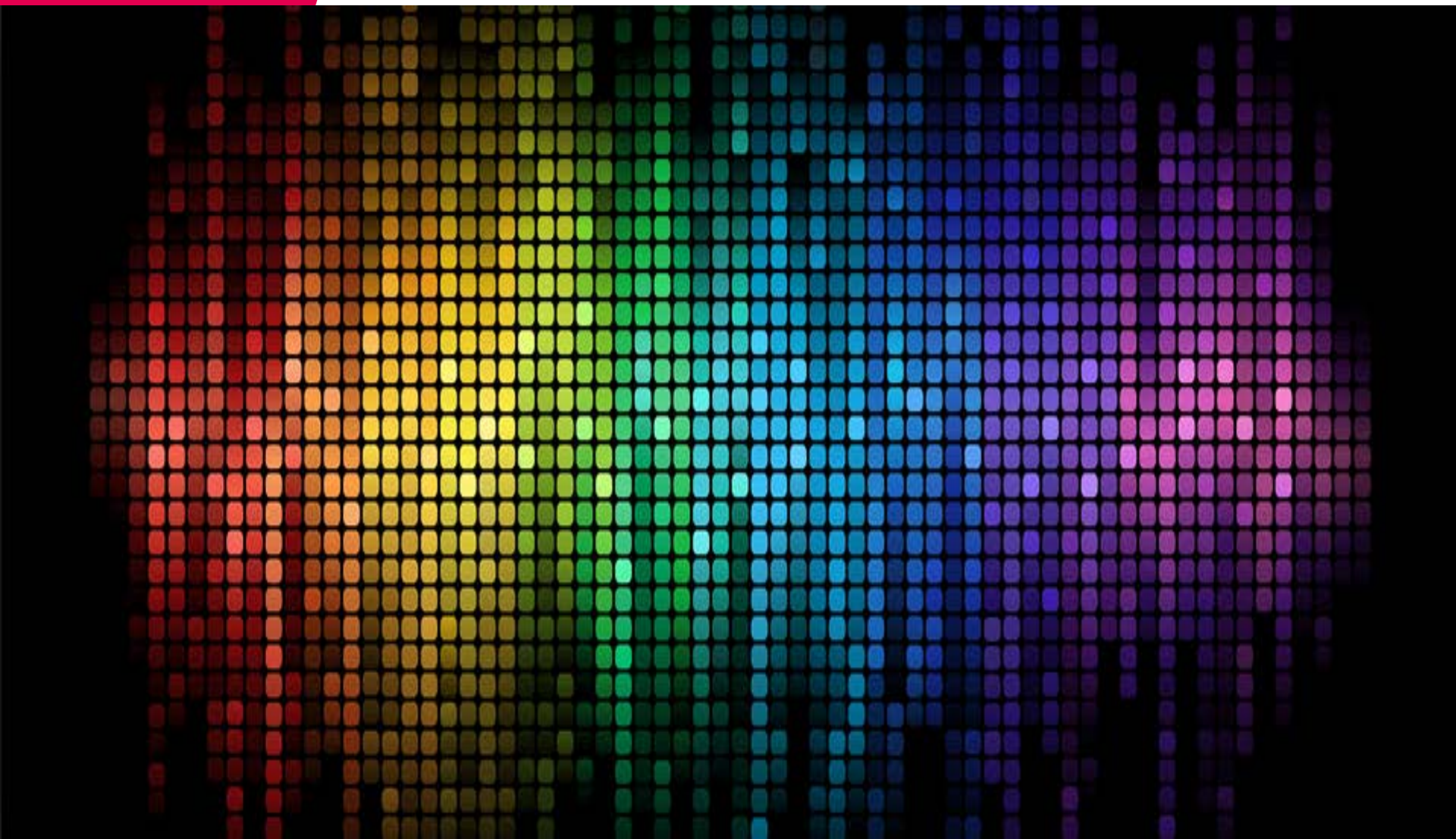



- Daglicht: waarom?
  - Spectrale samenstelling
  - Hoge verlichtingssterkte
  - Goede keurweergave
  - Uitzicht
  - …
- Geen daglichtwens bij thermisch/visueel discomfort
- Kunstverlichting niet uitgeschakeld bij voldoende daglicht
- Suggestie dat daglicht niet superieur is, maar kunstverlichting gelimiteerd![1]

[1] Bocye, P.R., (2014), Human factors in Lighting

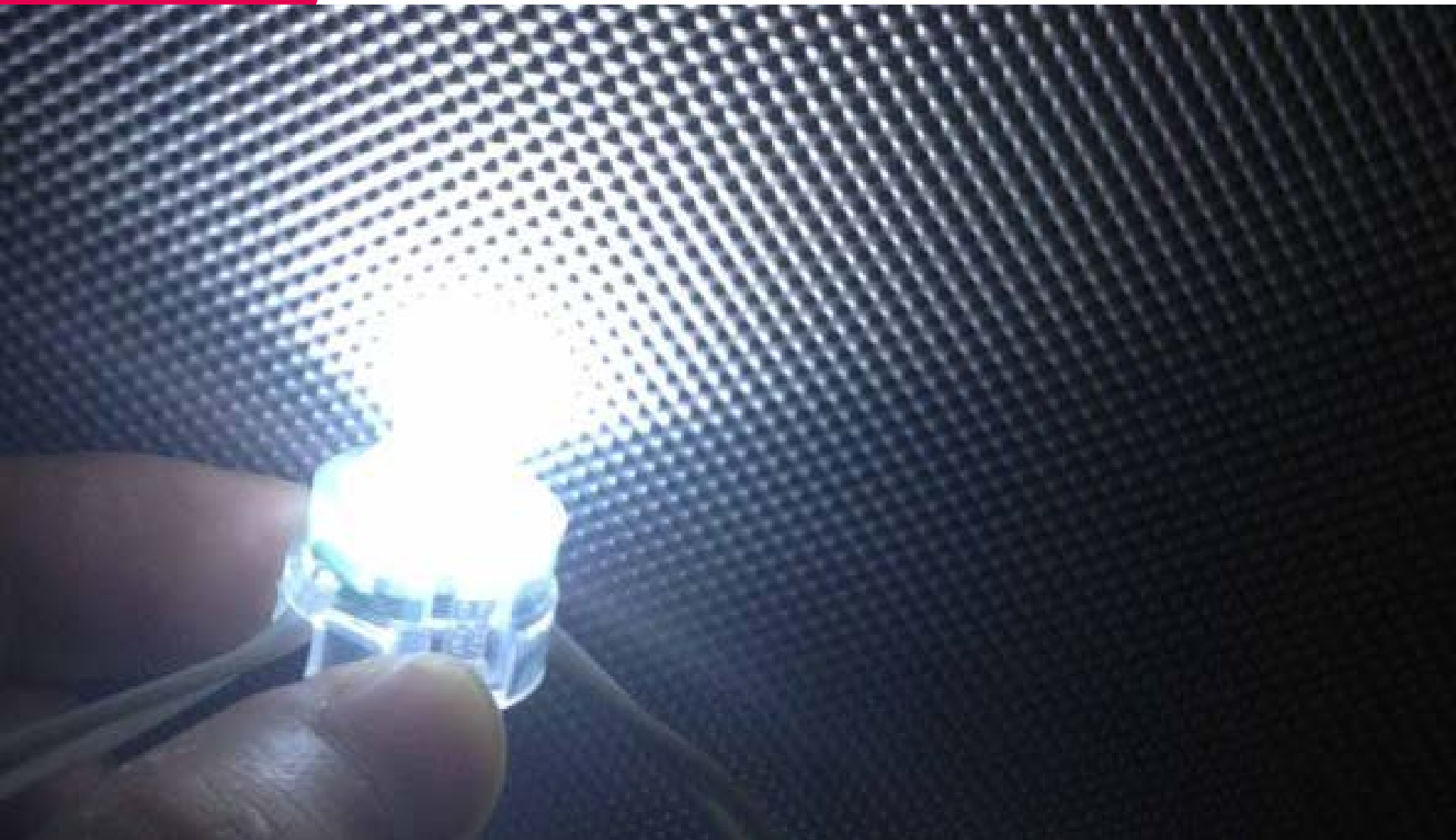
Verlichting

- Mogelijkheden met LED - kleurmogelijkheden



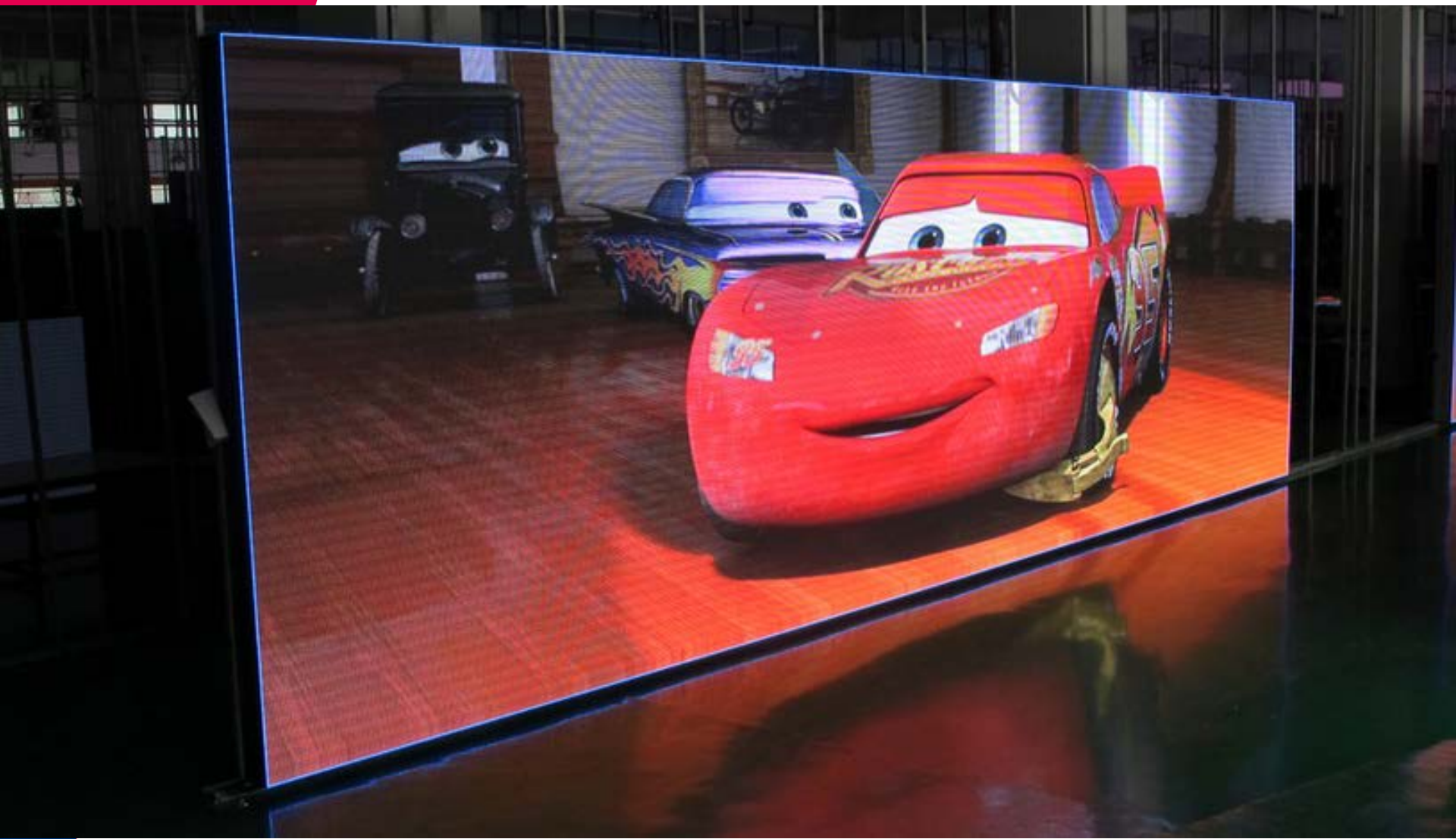
Verlichting

- Mogelijkheden met LED – hoge verlichtingssterkte



Verlichting

- Mogelijkheden met LED - beeldvorming



Verlichting

- Mogelijkheden met LED

Daglicht

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- Daglicht is dynamisch
- Mens geëvolueerd o.i.v. natuurlijke ritmes[1]
- In Westerse wereld 80-90% binnen
- Statische verlichtingssnormen
- Consequences voor gezondheid en comfort[1,2]

[1] Aries, M.B.C. et al., (2015), Daylight and health: a review of the evidence and consequences for the built environment
[2] Aarts, M.P.J. et al., (2015), Dynamic lighting systems in psychogeriatric care facilities in the Netherlands

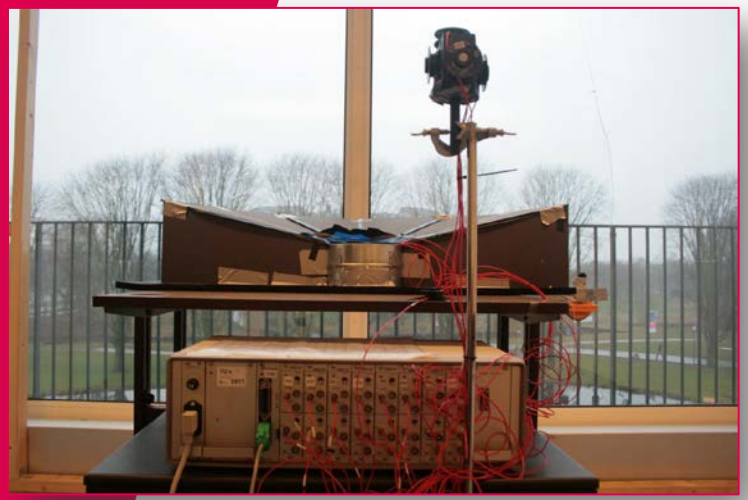
Daglicht karakterisering

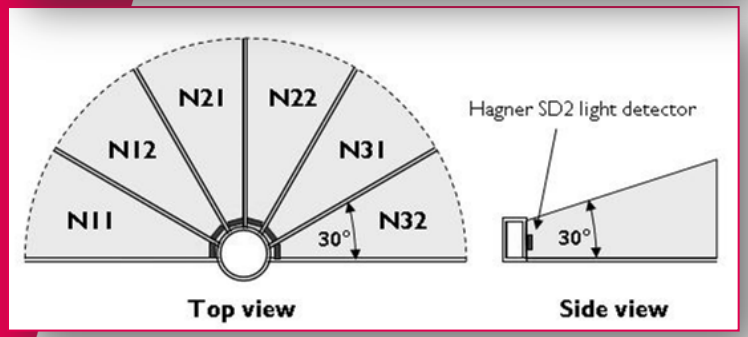
- Dynamiek
  - Hoeveelheid[1-3]
  - Spectrale samenstelling[4,5]
  - Invalsrichting[6,7]

[1] Aries, M.B.C. & Zonneveldt, L. (2011), Daylight variations in a moderate climate as input for lighting controls.
[2] Schreijen, S. (2014), Characterizing illuminance fluctuations of daylight in a room under different sky conditions
[3] Aries et al. , (*tbd*), Dynamic daylight classification: Application of the K-POP method
[4] Creemers, P., (2012), Difference between the daylight spectrum outside and in a room
[5] Pennings, D., (2014), Characteristics of the dynamics of the spectral power distribution from daylight
[6] Zonneveldt, L. & Aries, M.B.C., (2009). Development of a Daylight Discomfort Detector for control of shading
[7] Khademagha, P. et al . (*tbd*), Spectral and directional light distribution on a virtual retina

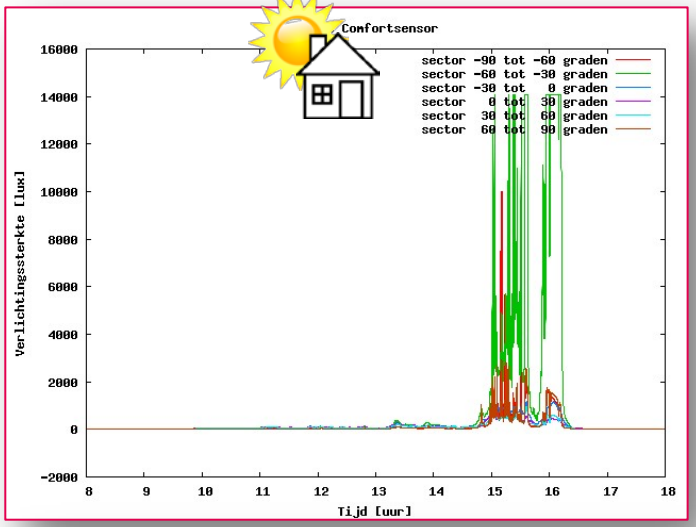
Dynamiek

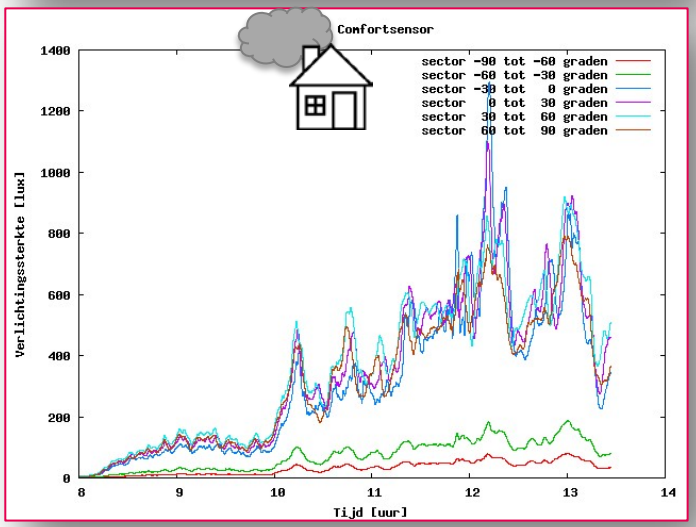
- Invalsrichting[1]





Vertikale verlichtingssterkte per invalssector



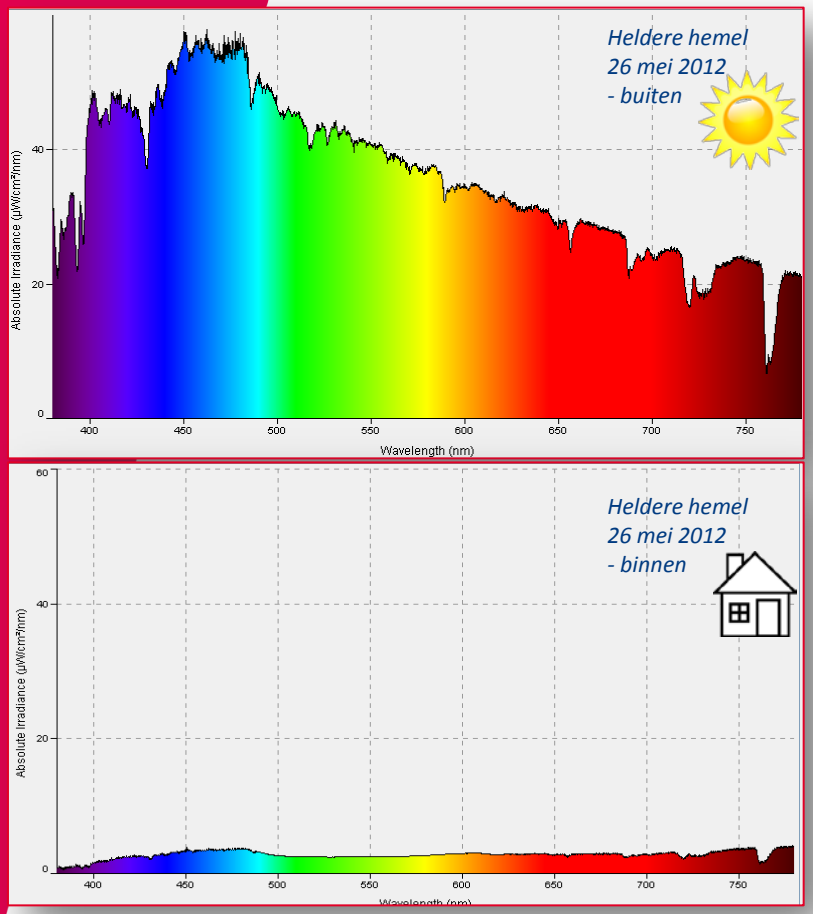


(Zonneveldt & Aries, 2009)

[1] Zonneveldt, L. & Aries, M.B.C., (2009). Development of a Daylight Discomfort Detector for control of shading

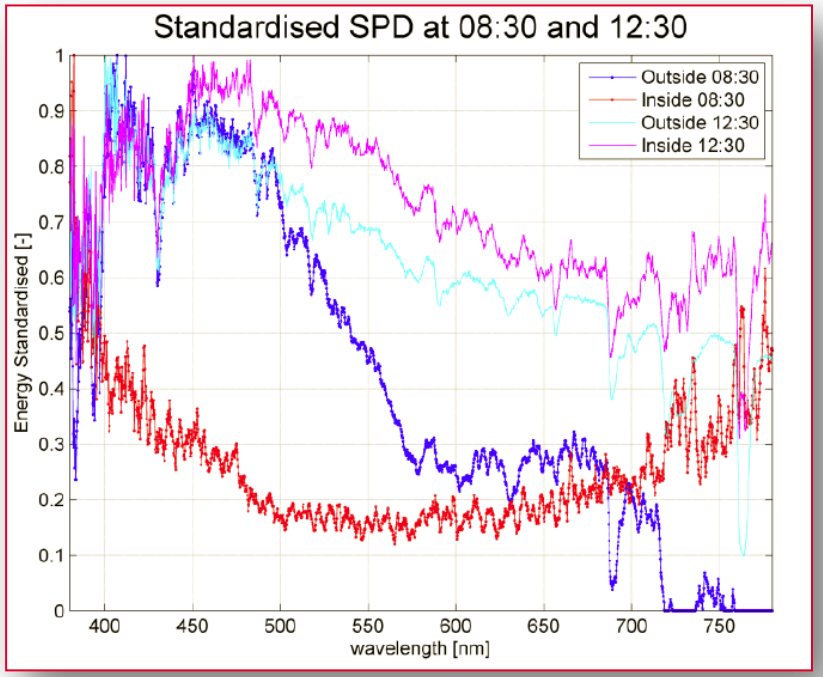
Dynamiek

- Spectrale samenstelling[1,2]



(Creemers, 2012)

Spectrale Power Distributie – bewolkte dag

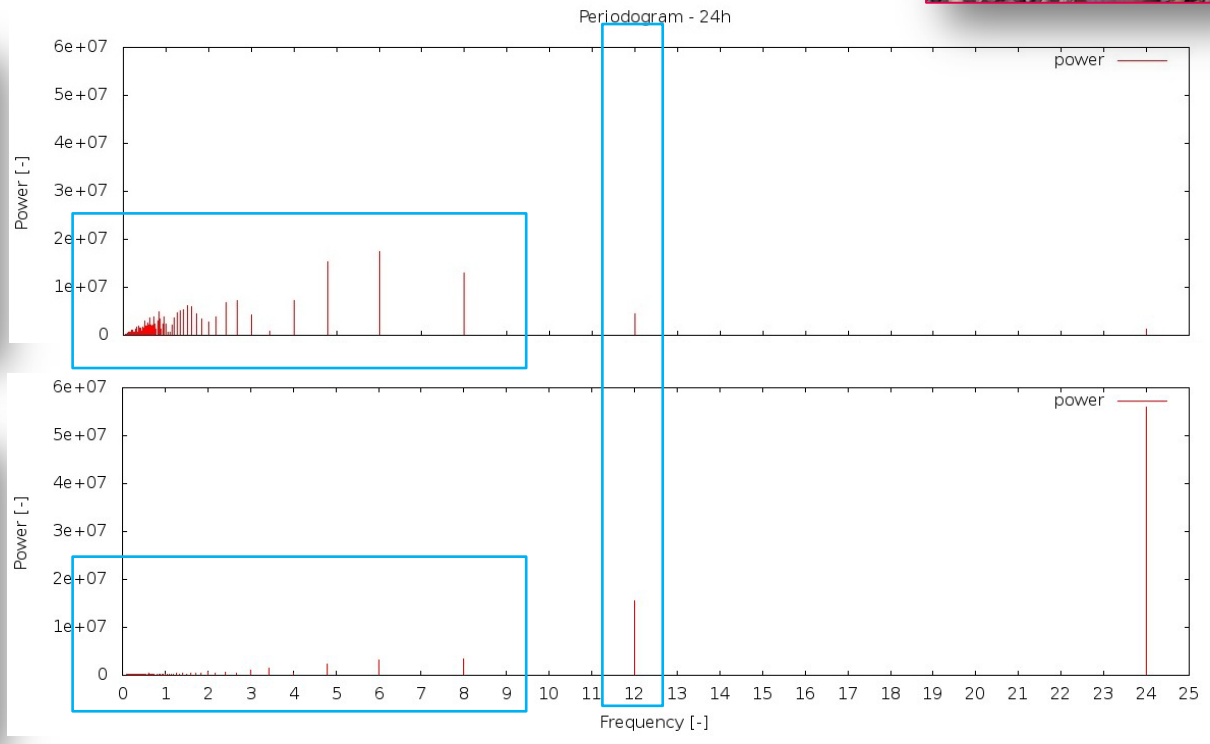


(Pennings, 2014)

[1] Creemers, P., (2012), Difference between the daylight spectrum outside and in a room
[2] Pennings, D., (2014), Characteristics of the dynamics of the spectral power distribution from daylight

Dynamiek

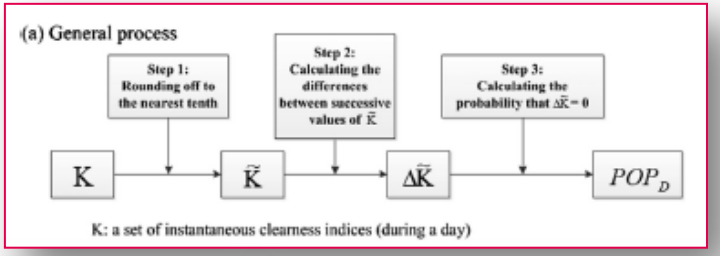
- Hoeveelheid licht
  - Fourier analyses[1,2]



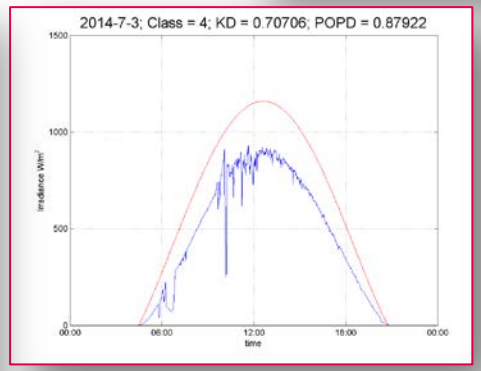
[1] Aries, M.B.C. & Zonneveldt, L. (2011). Daylight variations in a moderate climate as input for lighting controls
[2] Aries, M.B.C. & Rosemann, A.L.P., (2015), Dynamic daylight and input for intelligent (daylighting) control

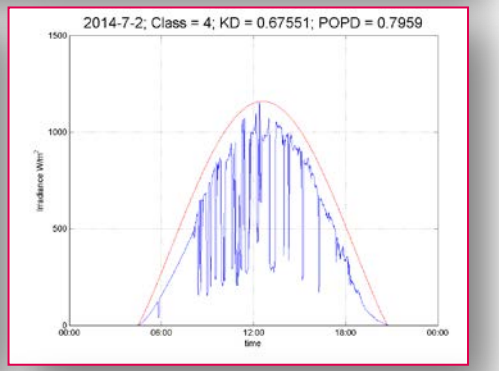
Dynamiek

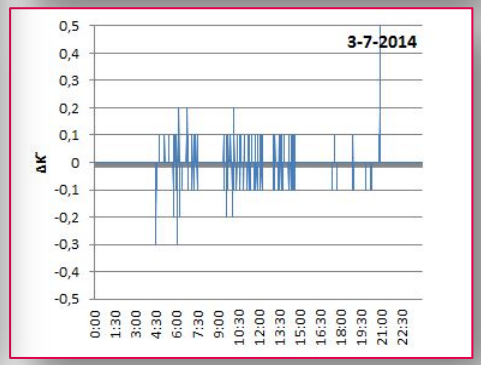
- Hoeveelheid licht
  - K-POP methode[1-3]

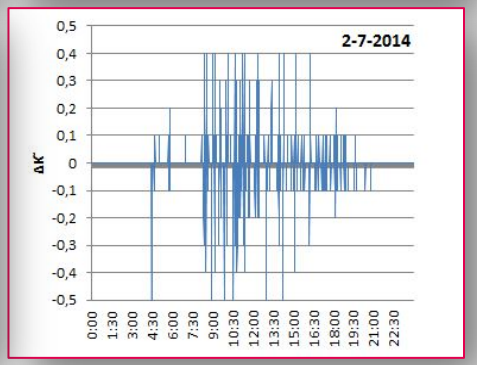


(Kang & Tam, 2013)







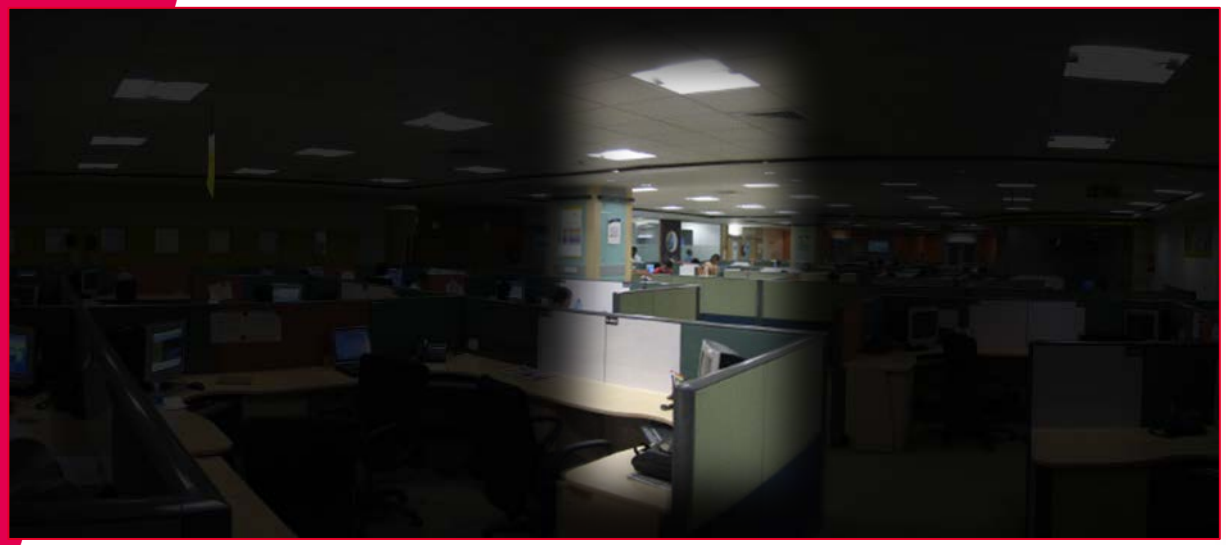


(Xu, 2015)

[1] Kang, B.O. & Tam, K-S., (2013), A new characterization and classification method for daily sky conditions based on ground-based solar irradiance measurement data
[2] Xu, X. (2015), Dynamic Aspects of Daylight Sky Classification
[3] Aries et al. , (*tbd*), Dynamic daylight classification: Application of the K-POP method

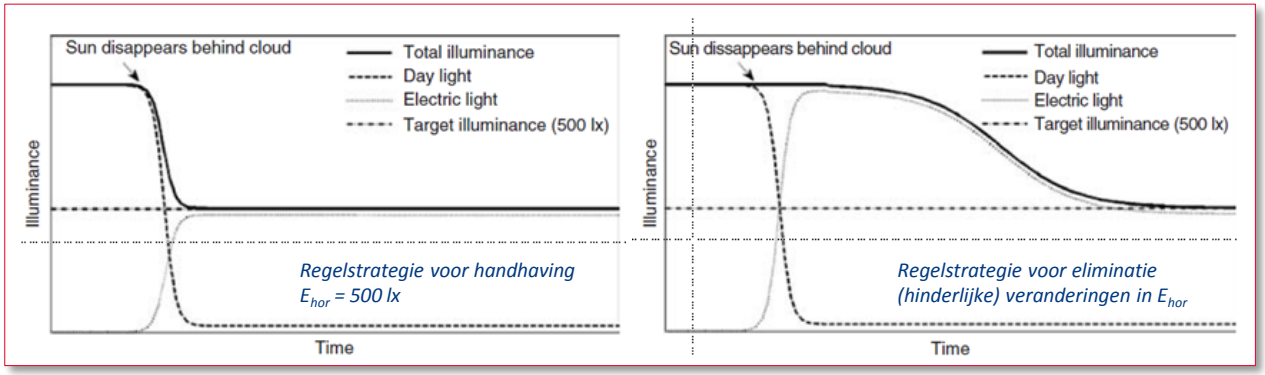
Balanceren & Vertalen

- Balans tussen
  - Aanbod
  - ‘Gewenste ritmiek’
- Comfort
  - Acceptatie van mensen
  - Consensus



Balanceren & Vertalen

- Balans tussen
  - Aanbod
  - ‘Gewenste ritmiek’
- Comfort
  - Acceptatie van mensen
  - Consensus
- Vertaling naar algoritmen[1]



(Rosemann et al., 2008)

[1] Rosemann et al., (2008), Cost-effective controlled illumination using daylighting and electric lighting in a dual-function prism light guide

Doel

- Natuurlijke daglichtritmes en menselijke ritmes (comfortable) op elkaar af stemmen
- Input leveren voor
  - Kunstlichtregelingen (hoeveelheid, spectrale samenstelling, richting)
  - Regelingen zon- en helderheidswering

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Vragen?

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