Looming Problems

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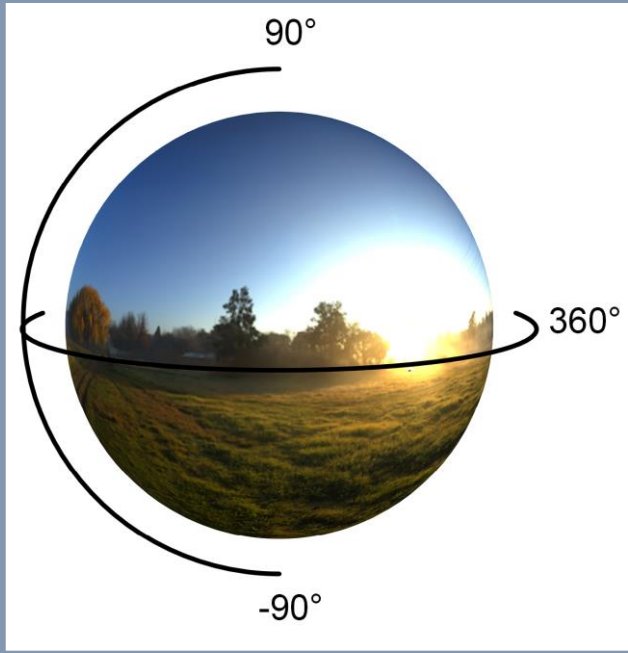
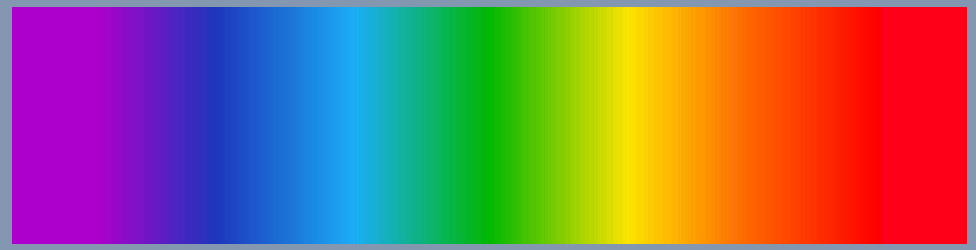
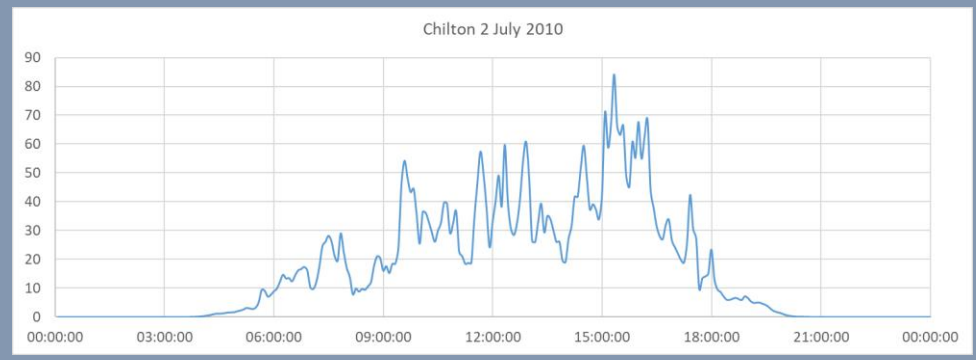
Some Issues

- The complexity in describing light and its impact
- Glare and Dazzle from Vehicles
- Inclusion
- PFI handback

Light Field Description & Impact





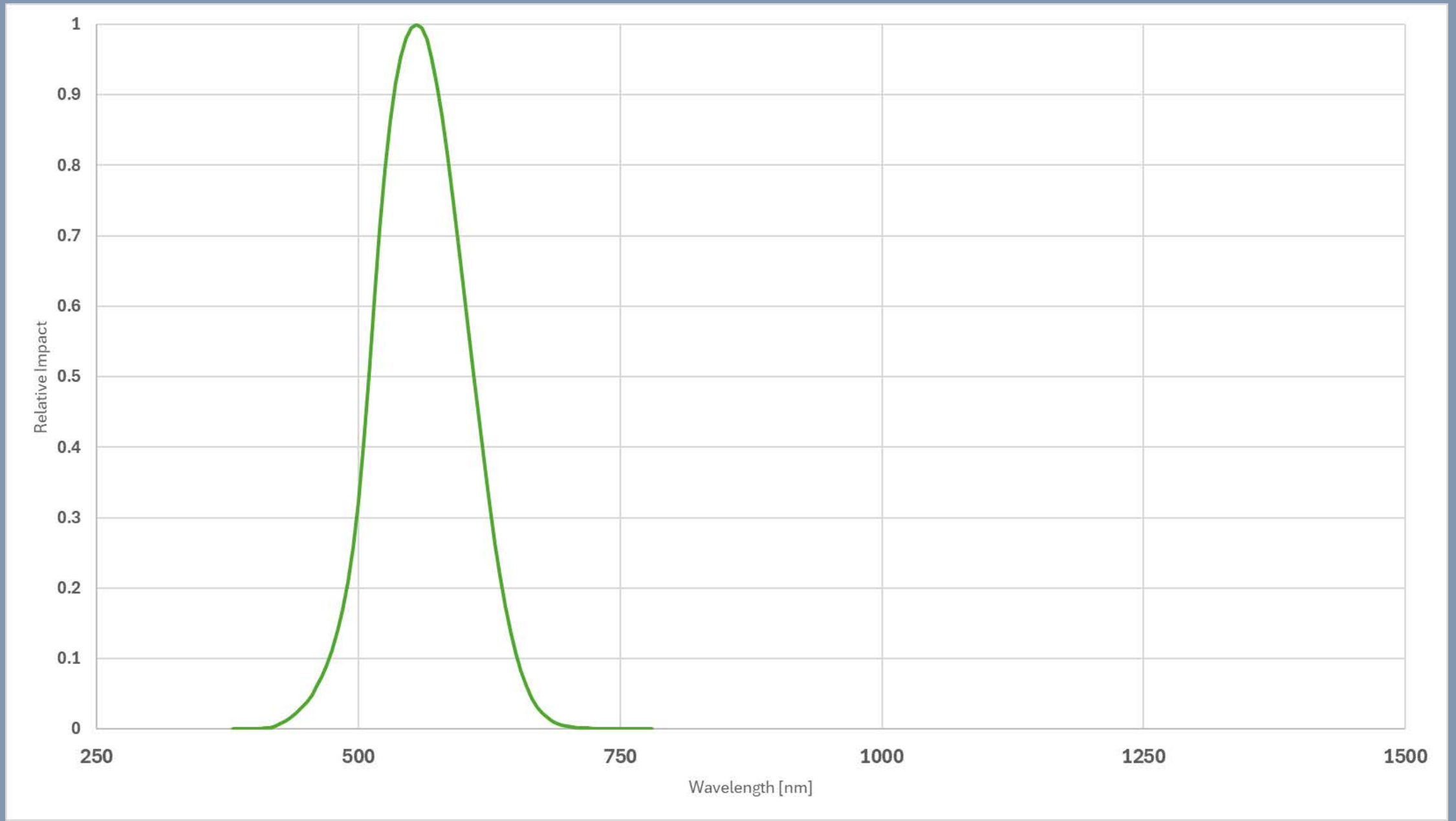


How do we cope!

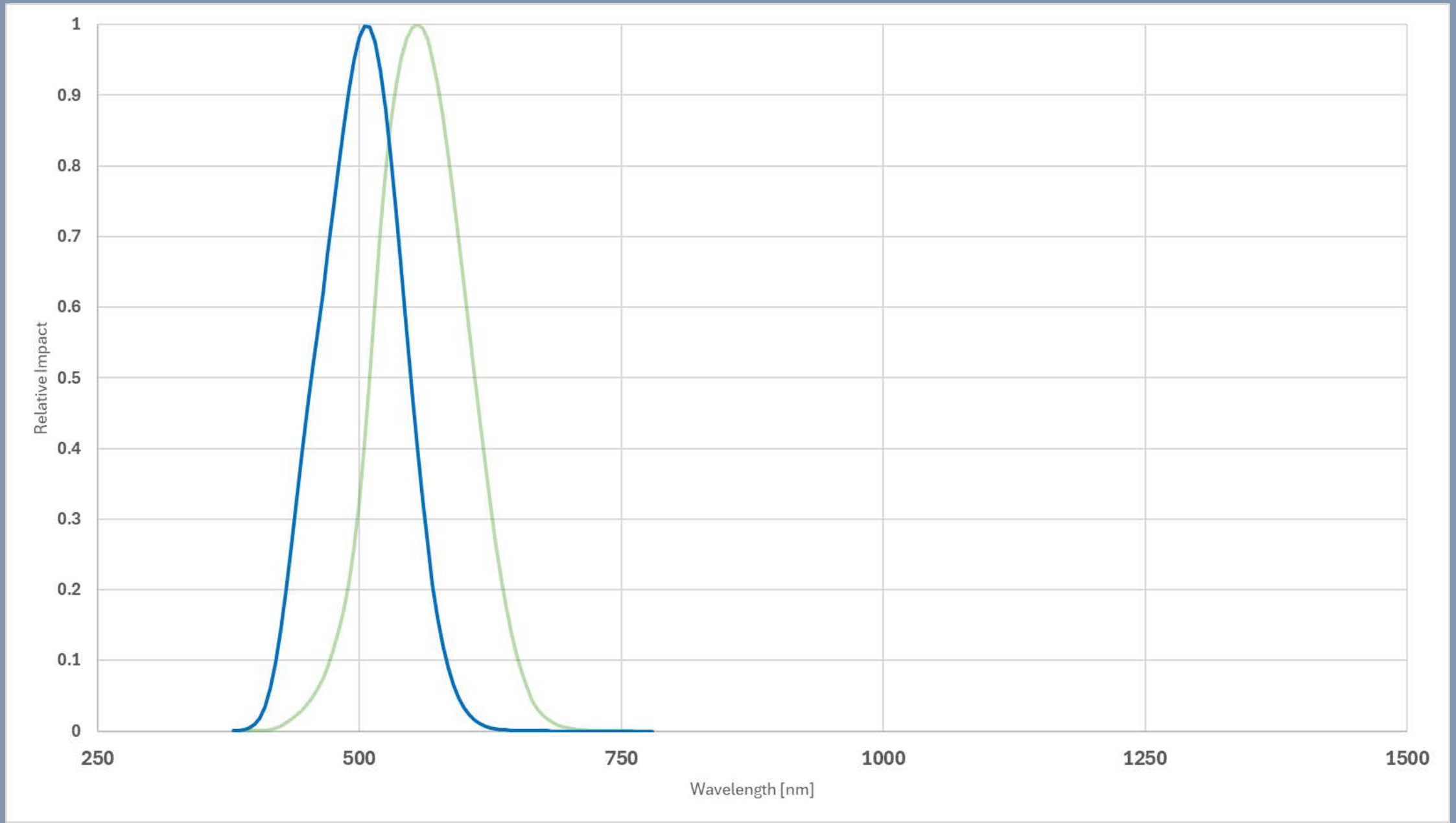
- Simplification – describing only part of the light field
  - Illuminance on the surface of a road
  - Luminance of a road surface
  - Light source spectrum reduced to CCT
  - …
- Problems in describing glare and obtrusive light

- Do we realise the impact of the simplifications we are making?

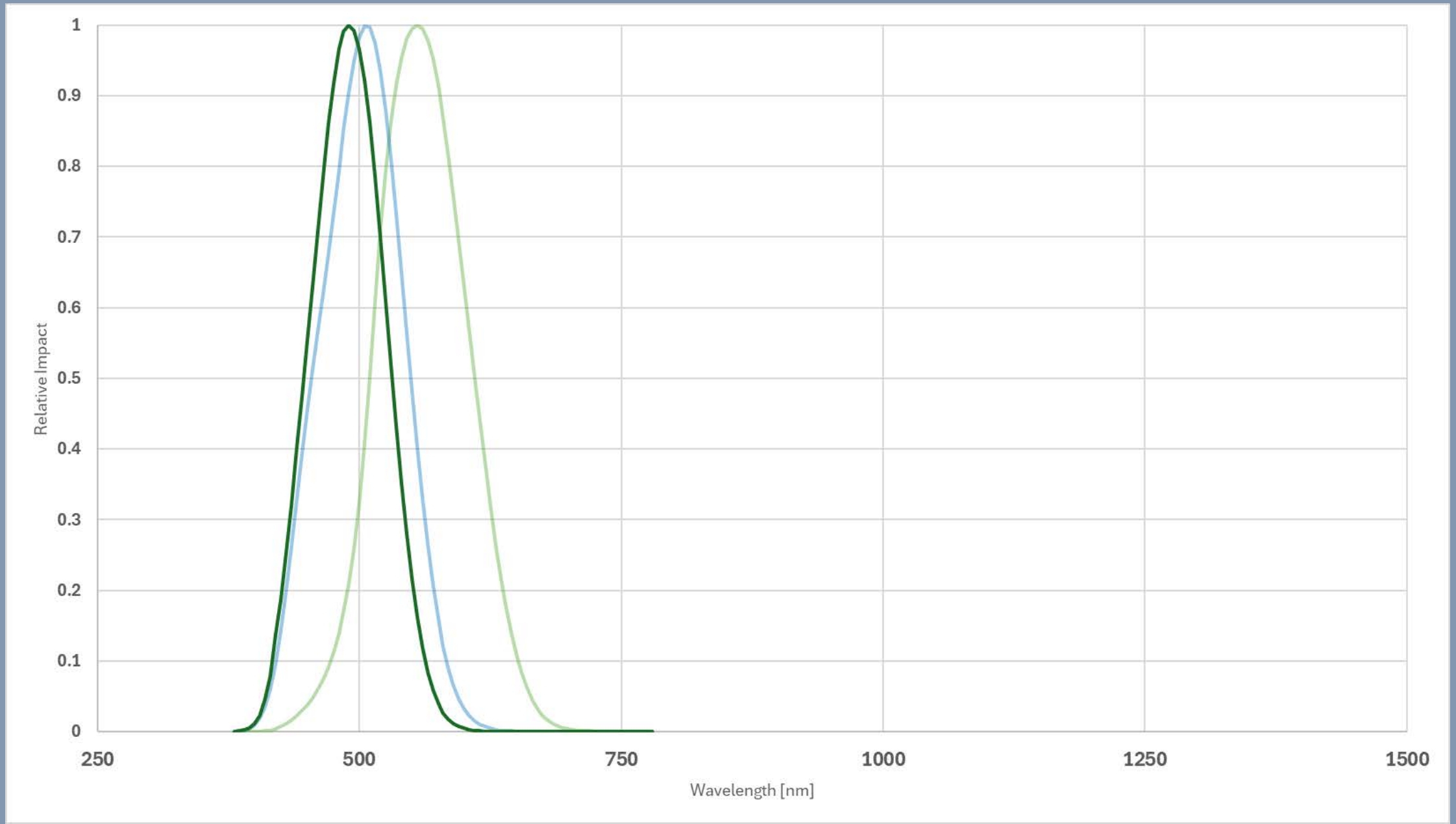
The Role of Spectrum – V(λ)



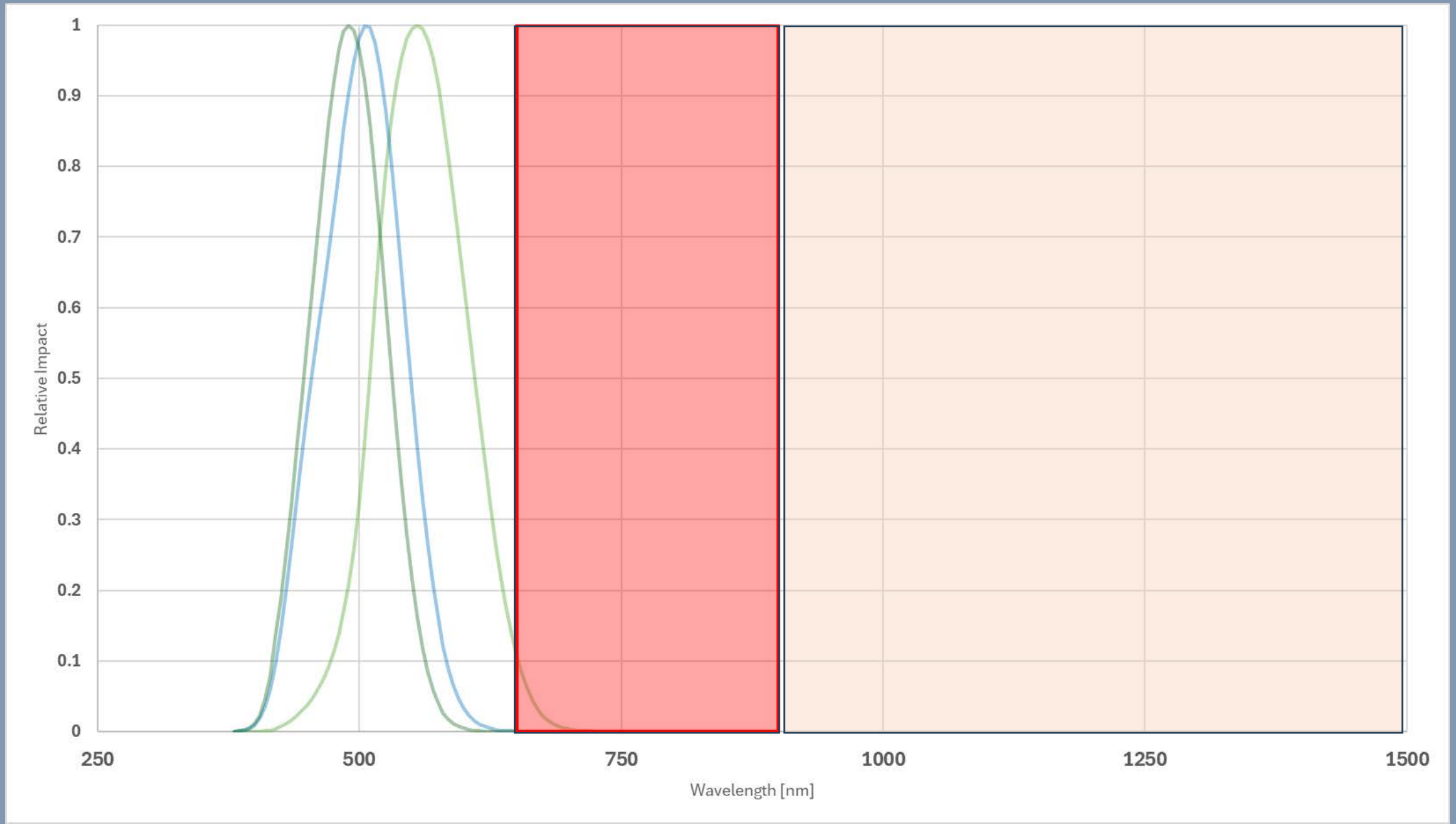
The Role of Spectrum – V’(λ) - Scotopic



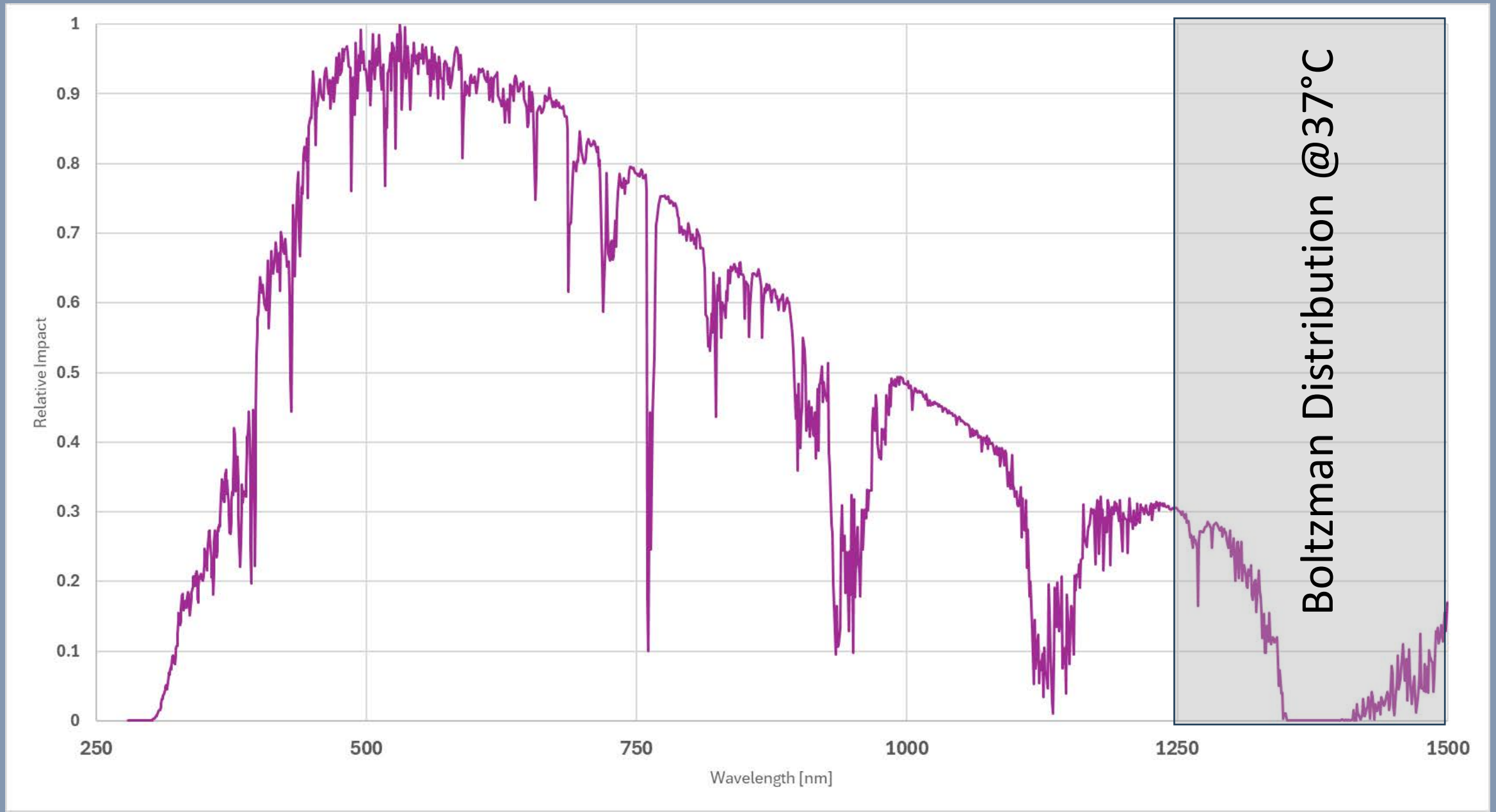
The Role of Spectrum – Melanopic



The Role of Spectrum – Red / Infrared



The Role of Spectrum – Evolution in Daylight?



Vehicle Glare

Vehicle Glare

Increasing Reports of Glare / Dazzle from Vehicle Headlights

What are the possible causes:

- Changes in vehicle headlight design
- Changes in road lighting
- Changes in road surface quality
- Changes in the spectrum of the light
- Changes in the population driving at night

Vehicle Glare

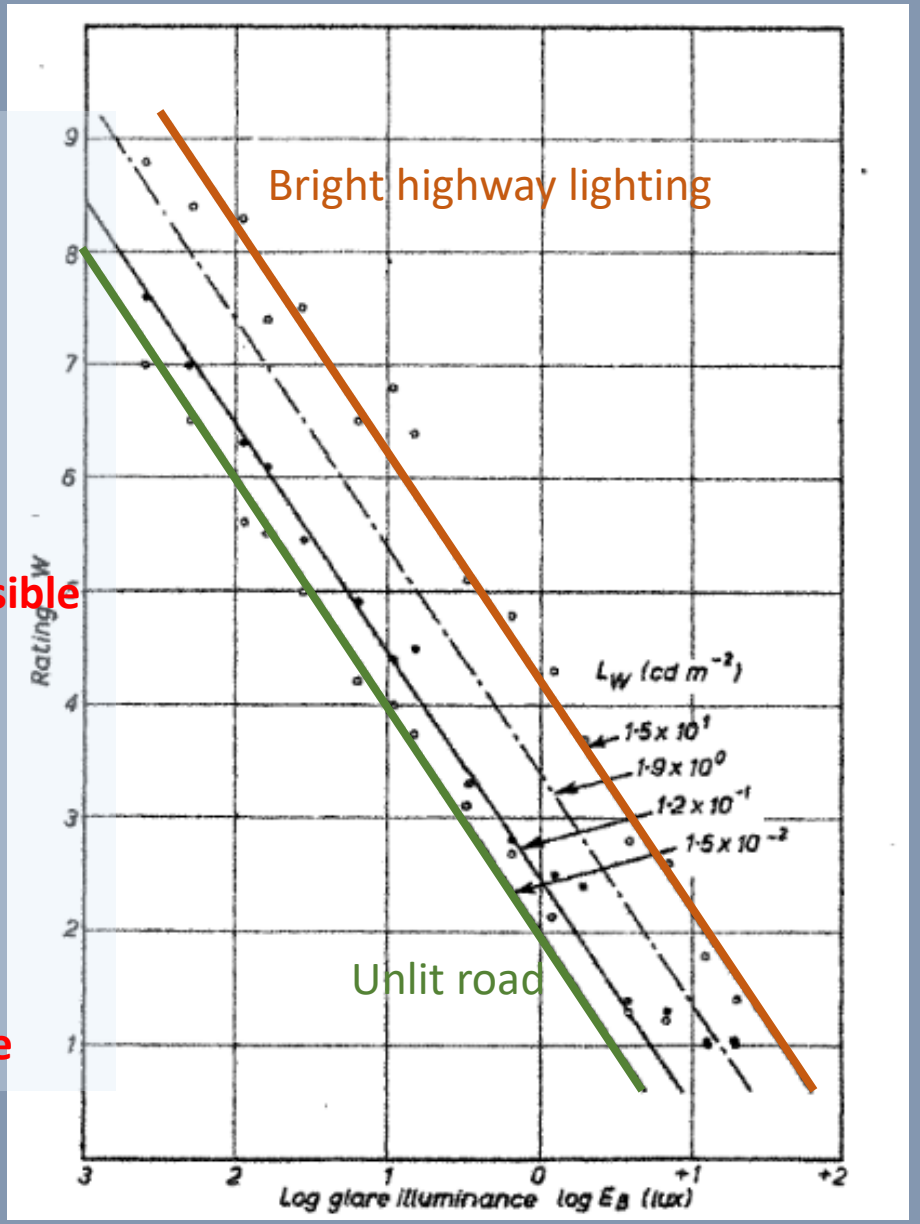
Noticeable

Acceptable

Just admissible

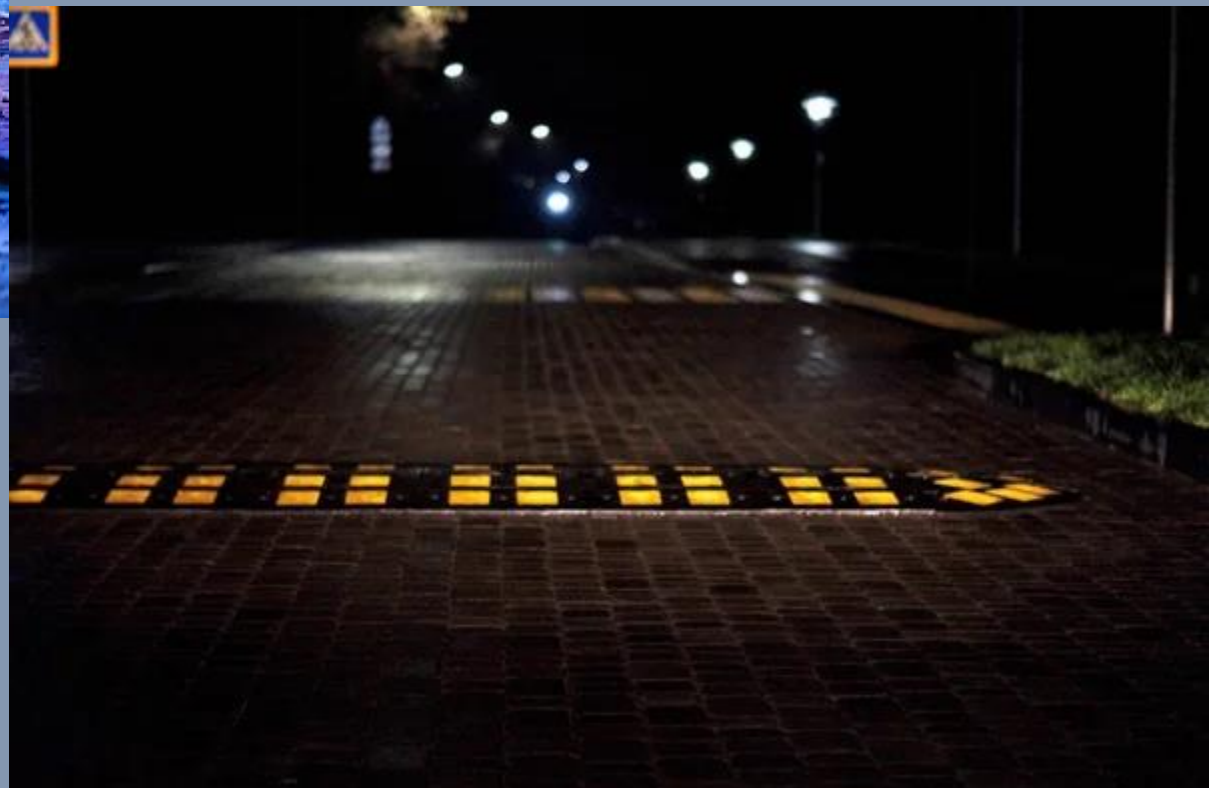
Disturbing

Unbearable



- Schmidt-Clausen & Bindels, Assessment of discomfort glare in motor vehicle lighting, Lighting Research & Technology V6-2 1974

Vehicle Glare



Vehicle Glare

Red Light

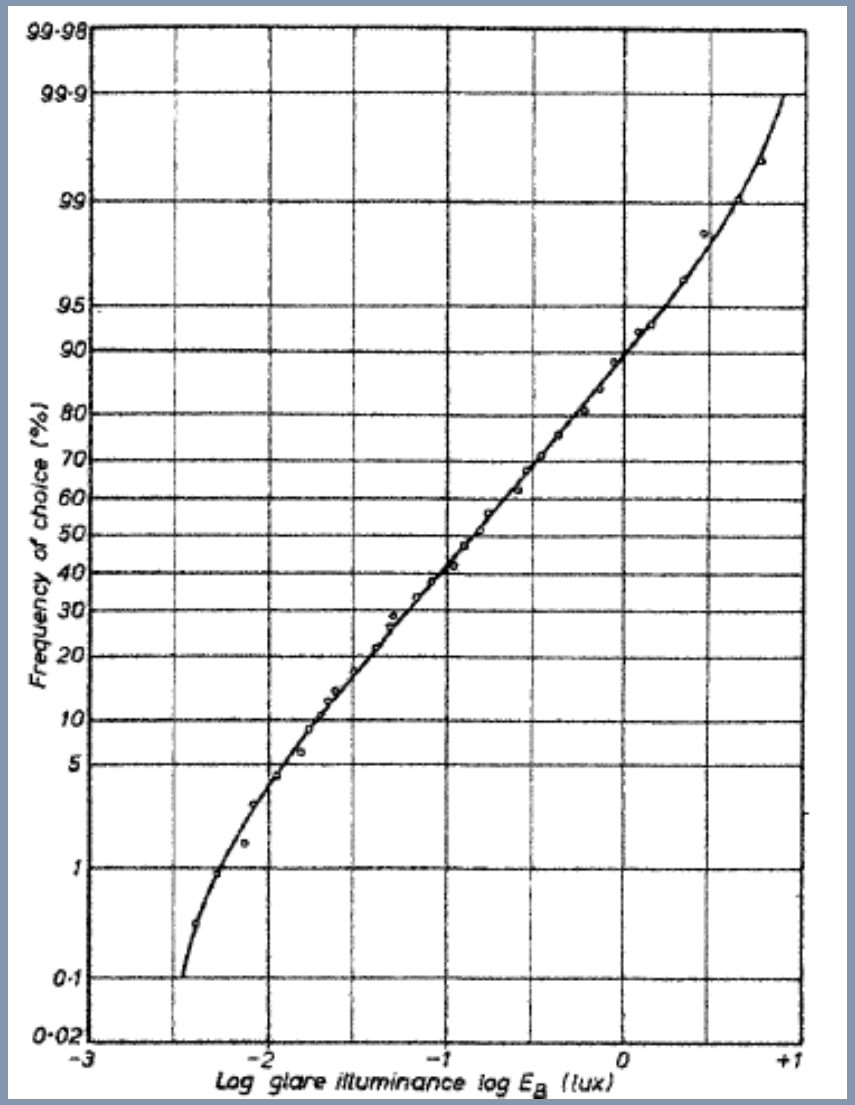
- Requirement – 5%
- TH Headlight – 18%

- No consideration of IR

$$k_{red} = \frac{\int_{\lambda=610\ nm}^{780\ nm} E_e(\lambda)\, V(\lambda)\, d\lambda}{\int_{\lambda=380\ nm}^{780\ nm} E_e(\lambda)\, V(\lambda)\, d\lambda} \geq 0.05$$

Vehicle Glare

- Glare rating of 5 – *Just admissible*
- Subject age range 25 to 35
- Divergence of 3 log units in sensitivity
- Neural divergence found in subjects

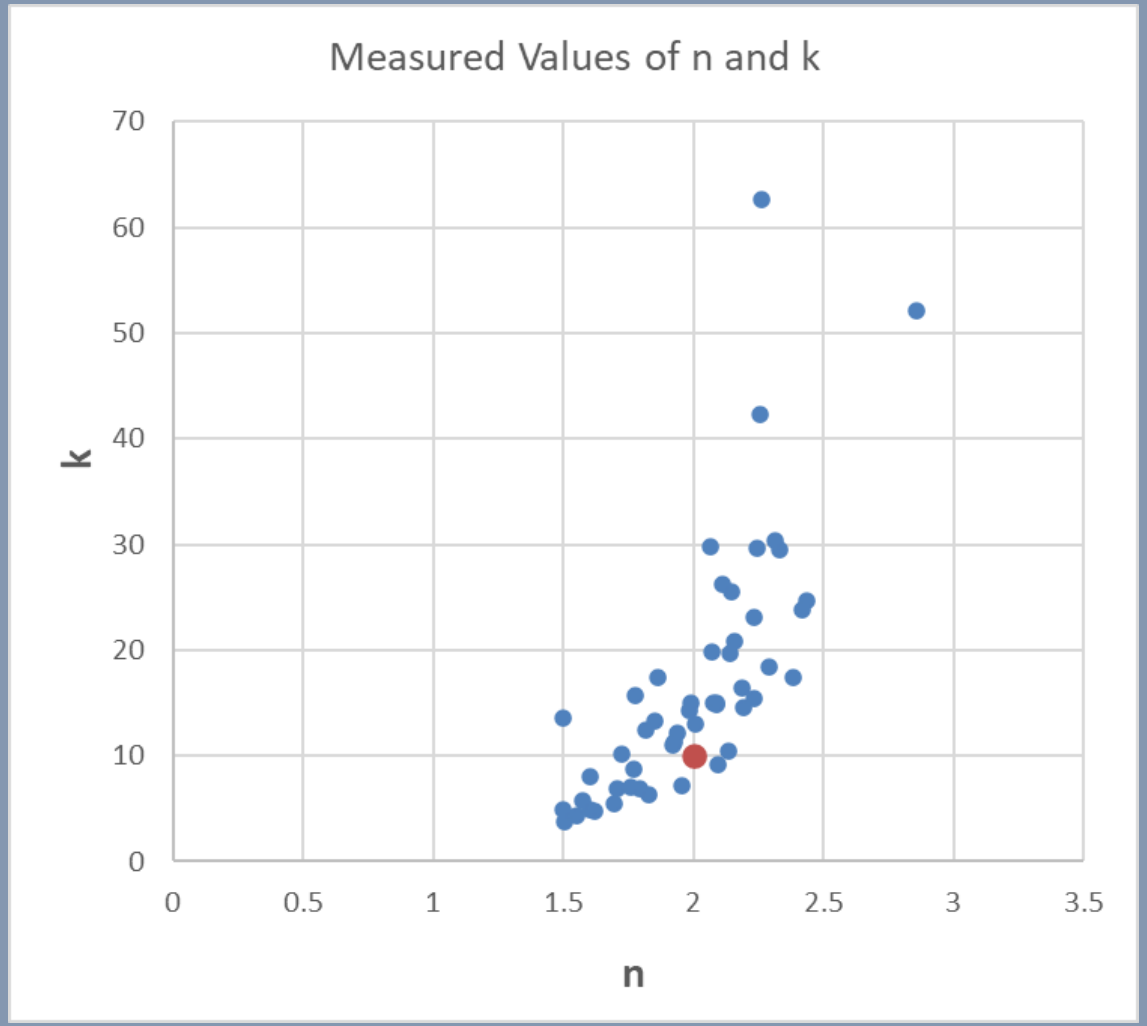


- Schmidt-Clausen & Bindels, Assessment of discomfort glare in motor vehicle lighting, Lighting Research & Technology V6-2 1974
- Yingxin Jia, A study of mechanisms for discomfort glare, PhD Thesis, School of Health Sciences, City University, 2014
- Furlan, Bargary et al., Cortical hyperexcitability and sensitivity to discomfort glare, DOI: 10.1016/j.neuropsychologia.2015.02.006

Inclusion – Veiling luminance

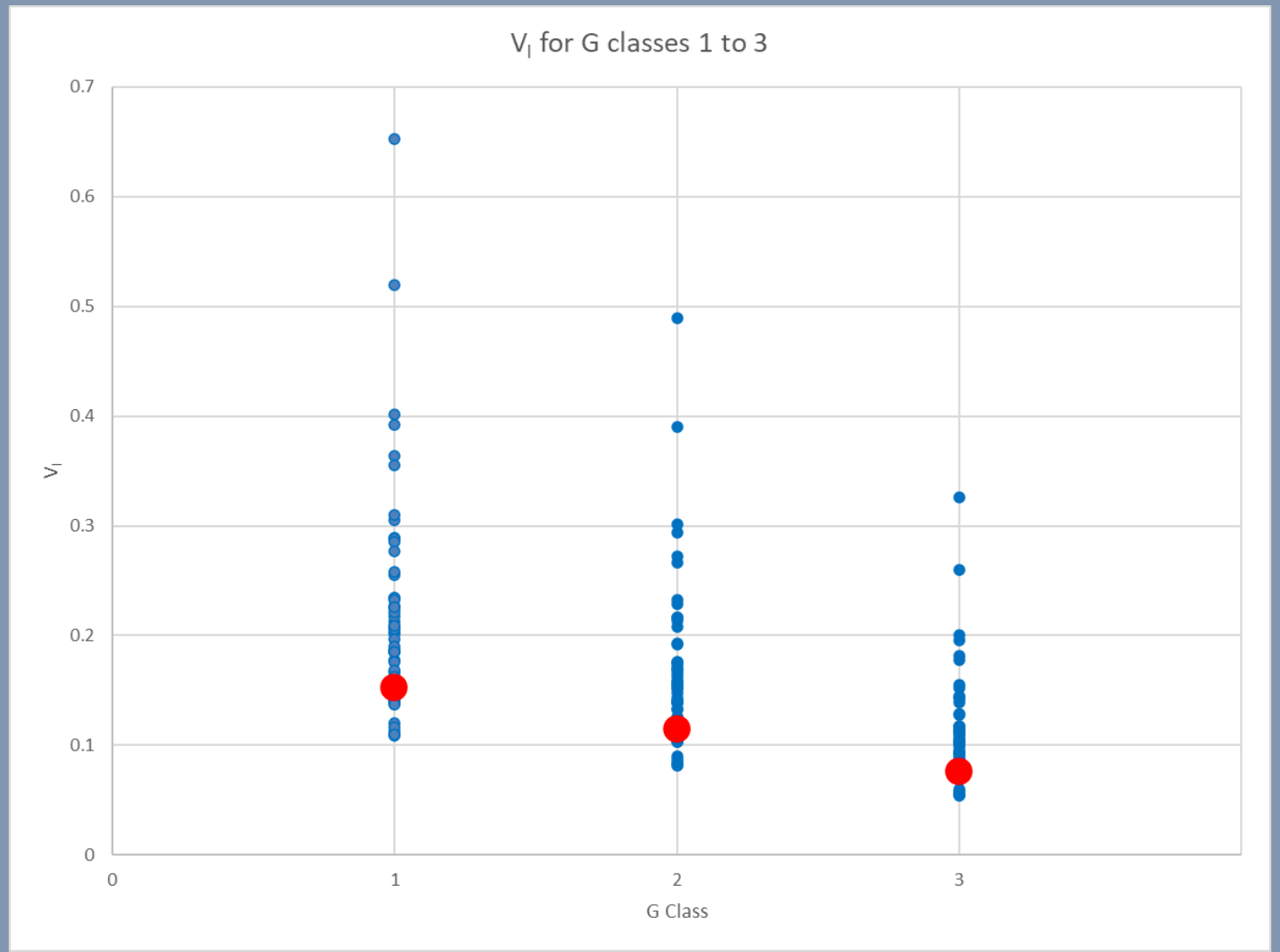
$$V_l = k \sum \frac{E_{eye}}{\theta^n}$$

By convention k = 10, n =2

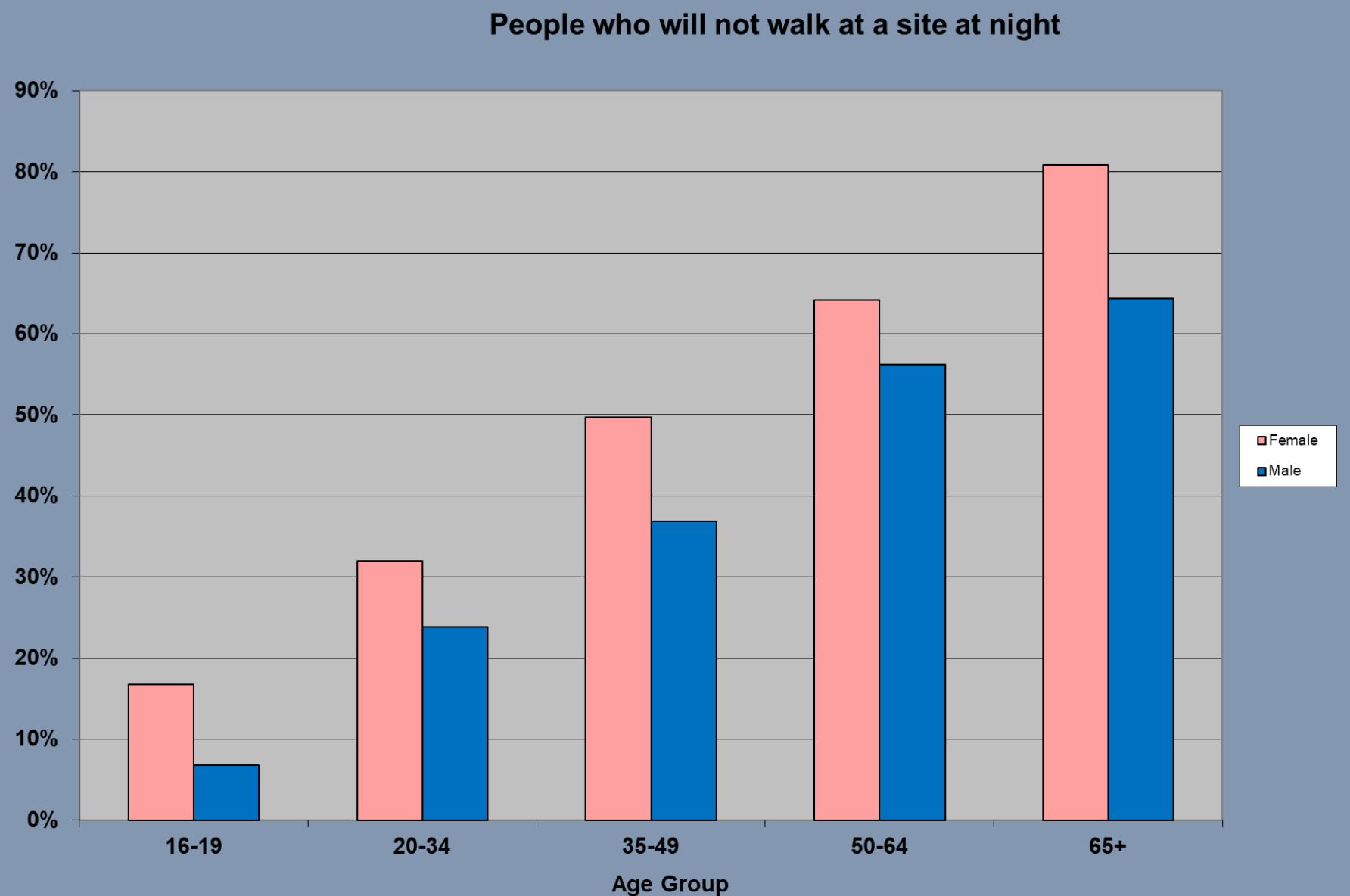


Inclusion – Veiling luminance

V_l calculated for 5m mounting height, 3,000 lm lantern 1.5m observer eye height



Inclusion – Use of streets at night



End of PFI

- Currently there are 31 street lighting PFIs with a value of £2.63 bn
- Recommended handover period 7 years
- Expectations:
  - Minimise disruption
  - Comply with project agreement
  - Optimise outcomes
  - Meet needs of stake holders

End of PFI

Key Issues

- Shortage of capacity & skills
- Asset return
  - Inventory accuracy
  - Assess condition
- Plans for service continuity
- Future plans for service development

- Does the existing lighting provision match the current aspirations?

Questions?