Lamp Spectrum and Light Pollution

The other side of yellow light

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Summary

- Rayleigh scattering by molecules in the atmosphere and scotopic visual response greatly increase the impact of blue-rich light sources on “sky glow” light pollution.

- In clear air and when looking overhead, lumen-for-lumen metal halide lighting can have 2.8x the impact of HPS, and 12x that of LPS.

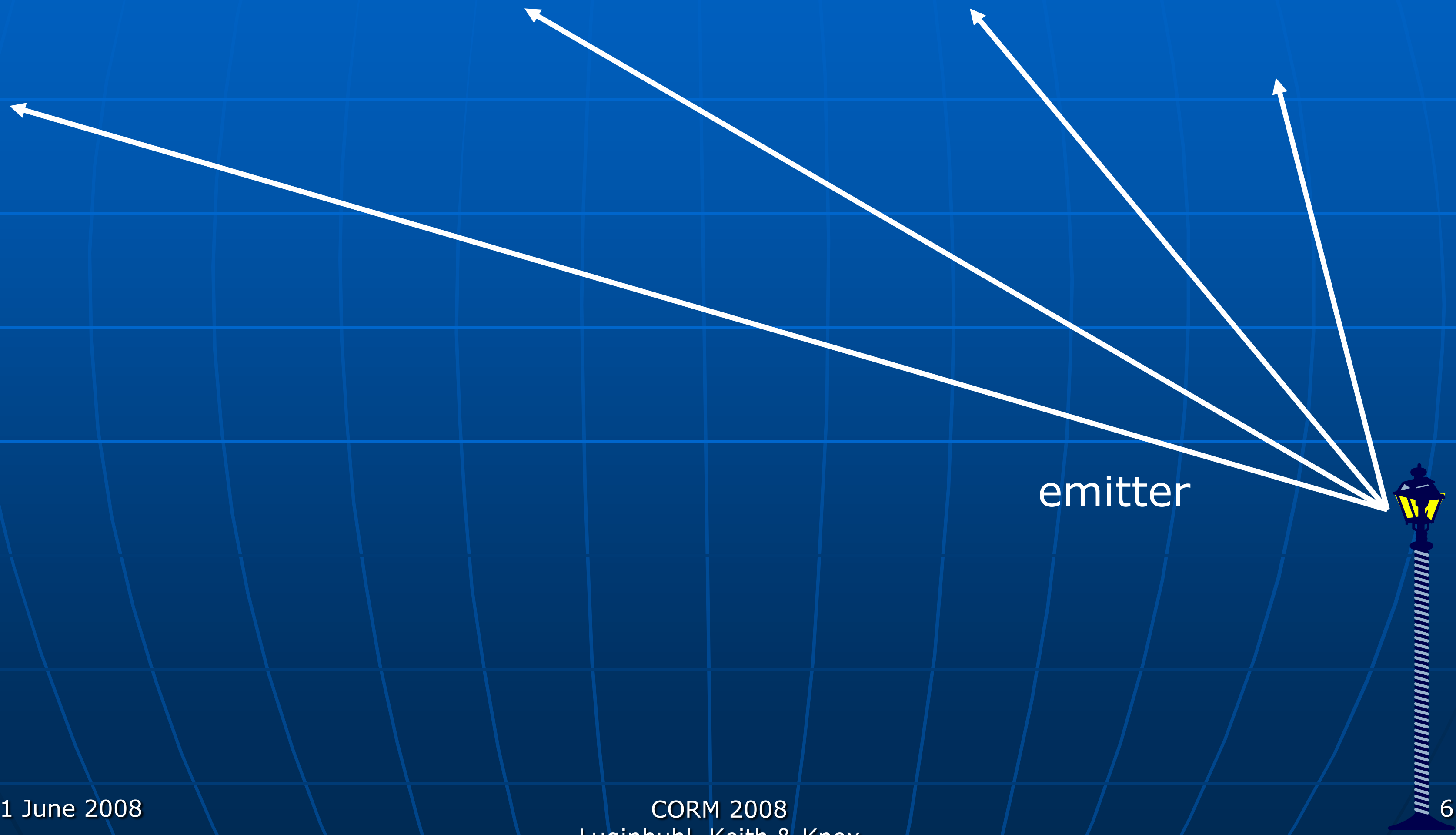
Light Pollution

- Sky Glow
- Glare
- Light Trespass
- Reduced Visibility

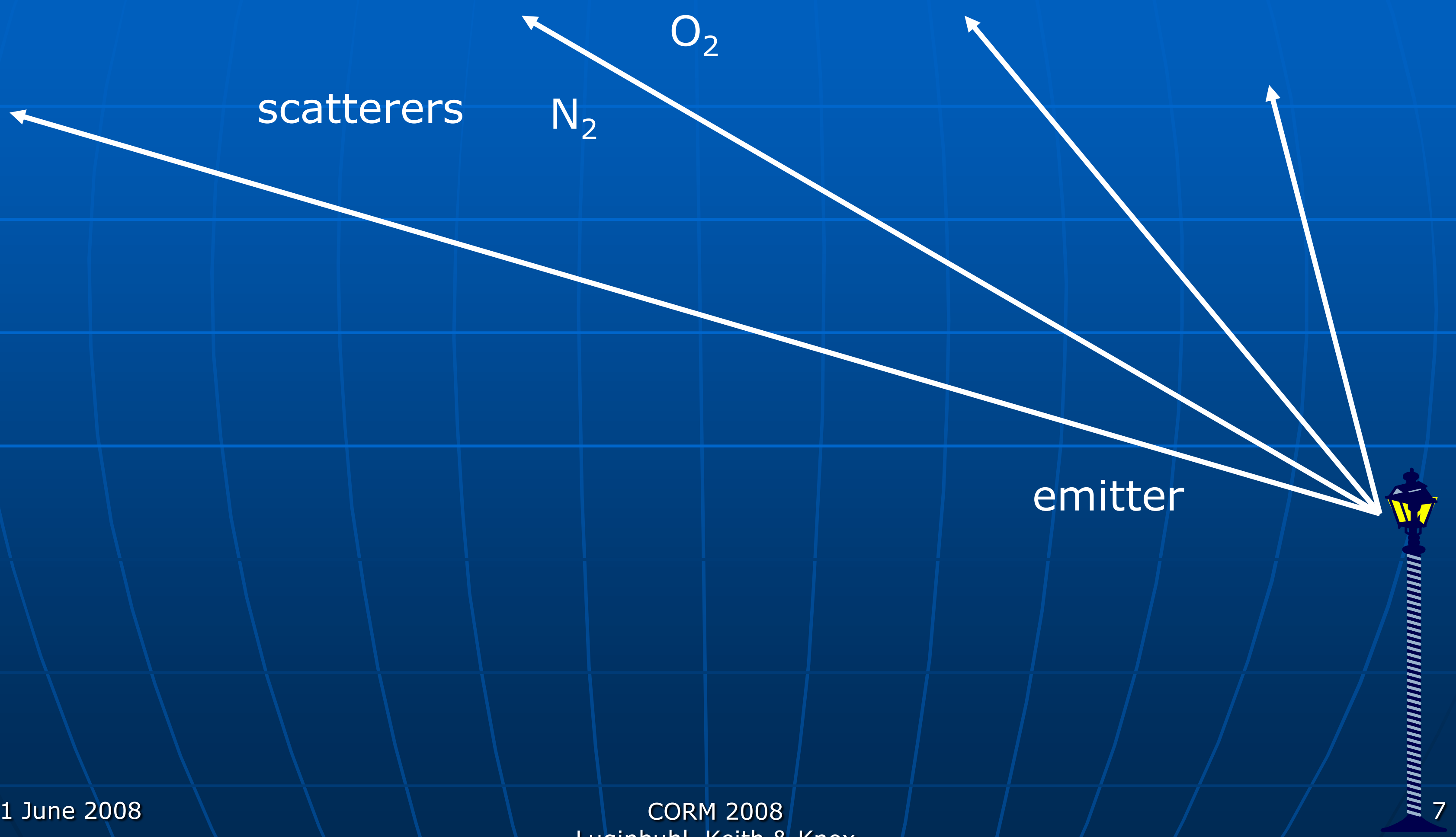
Light Pollution

emitter

Light Pollution



Light Pollution



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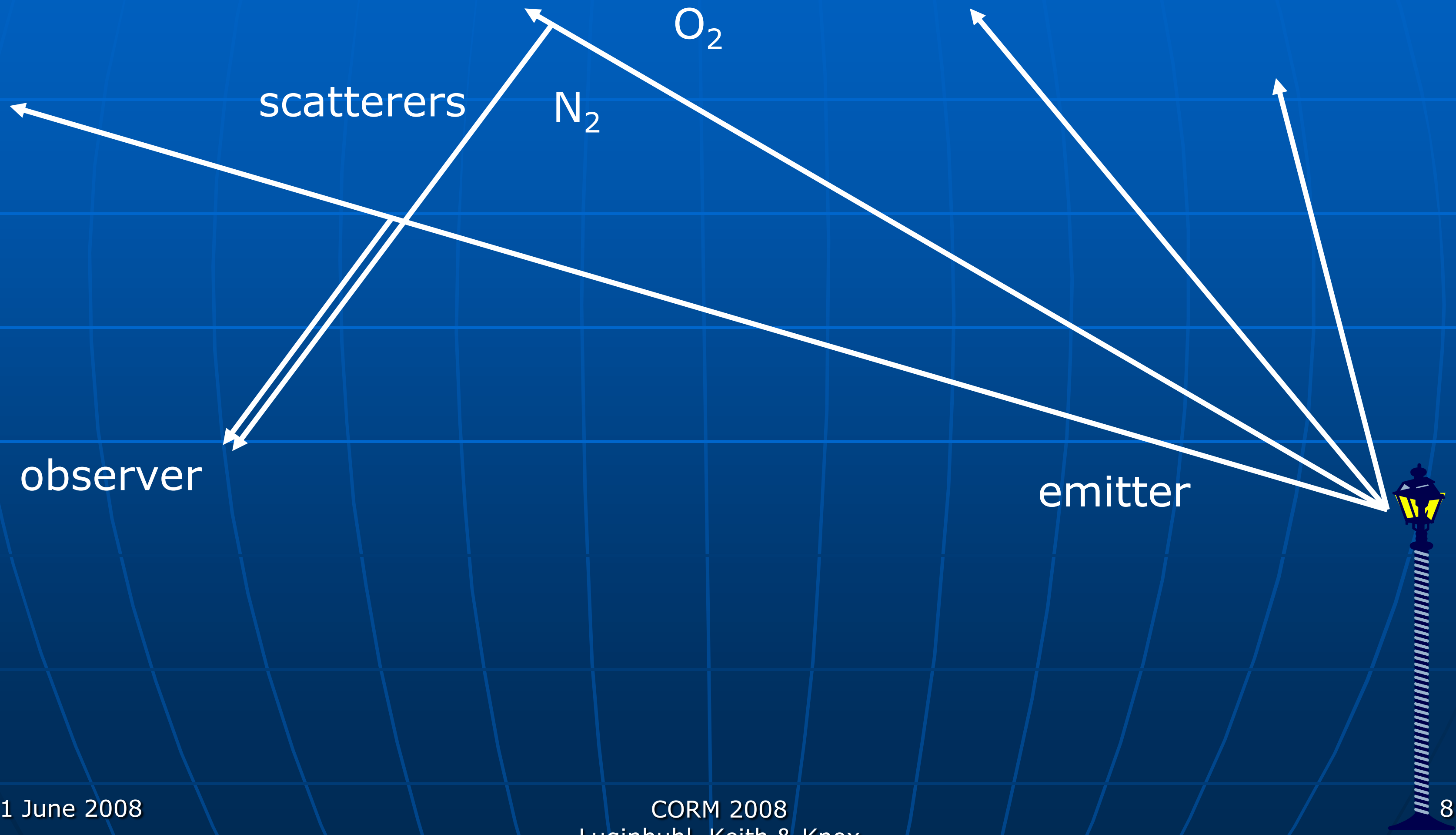

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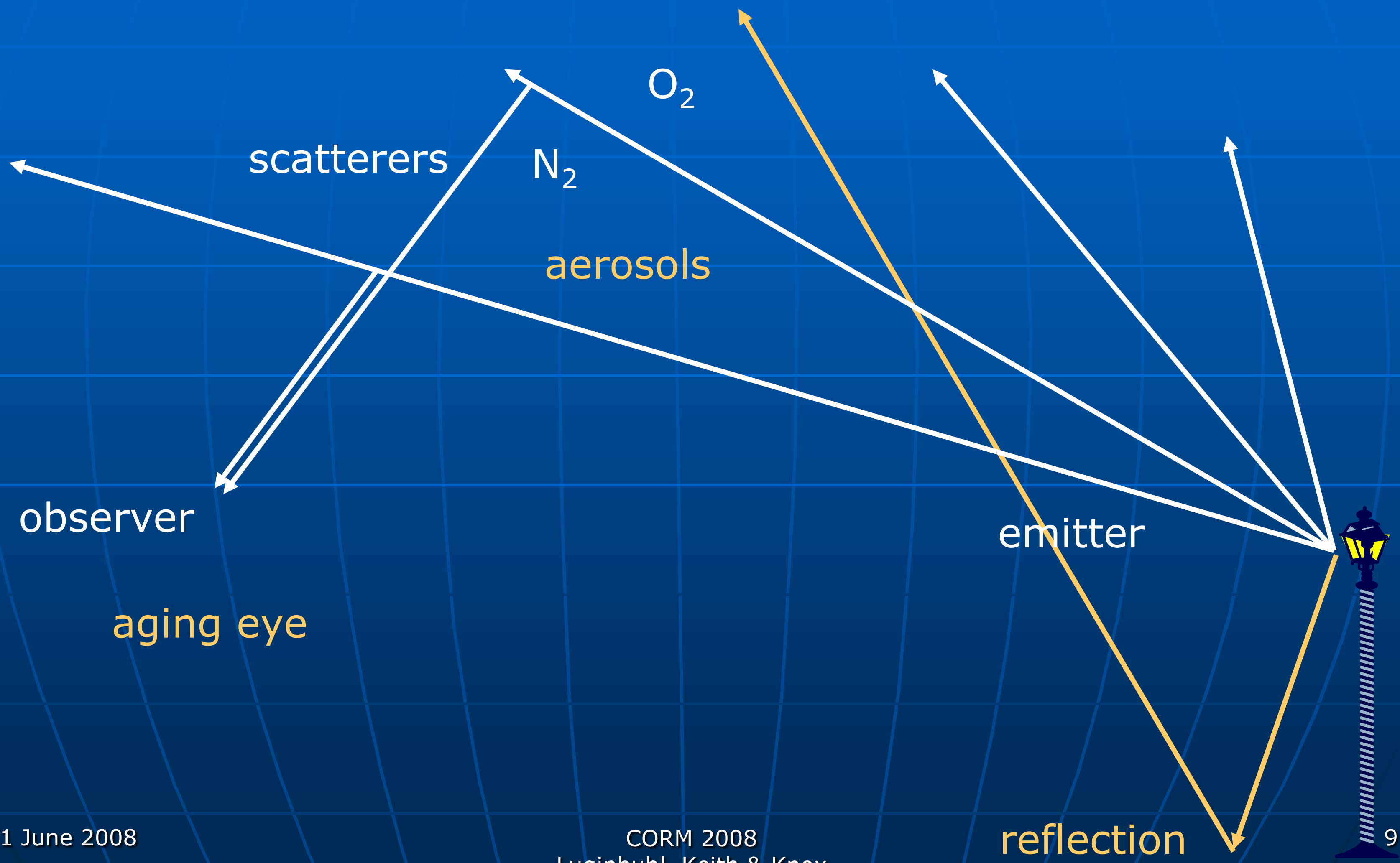

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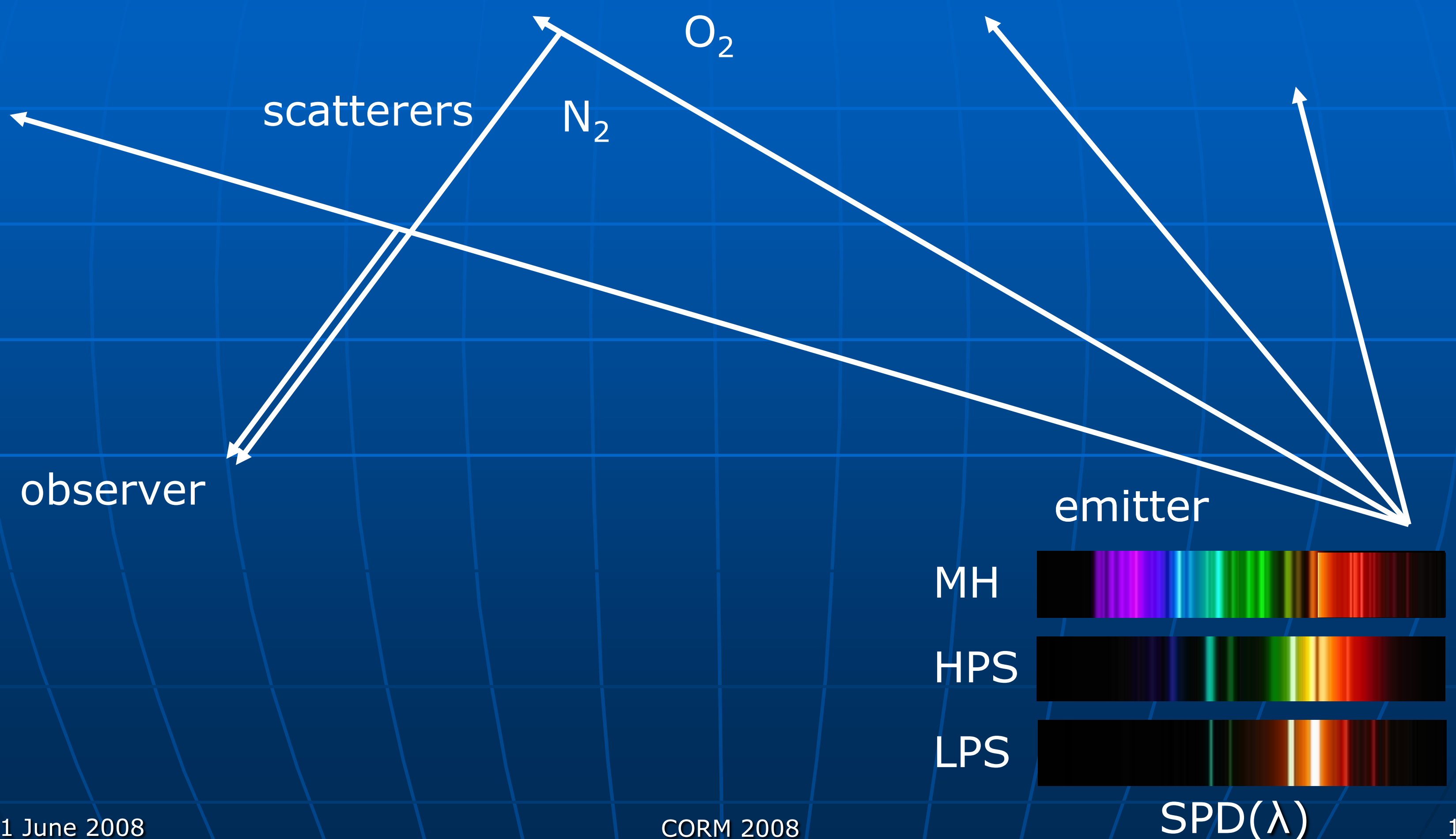

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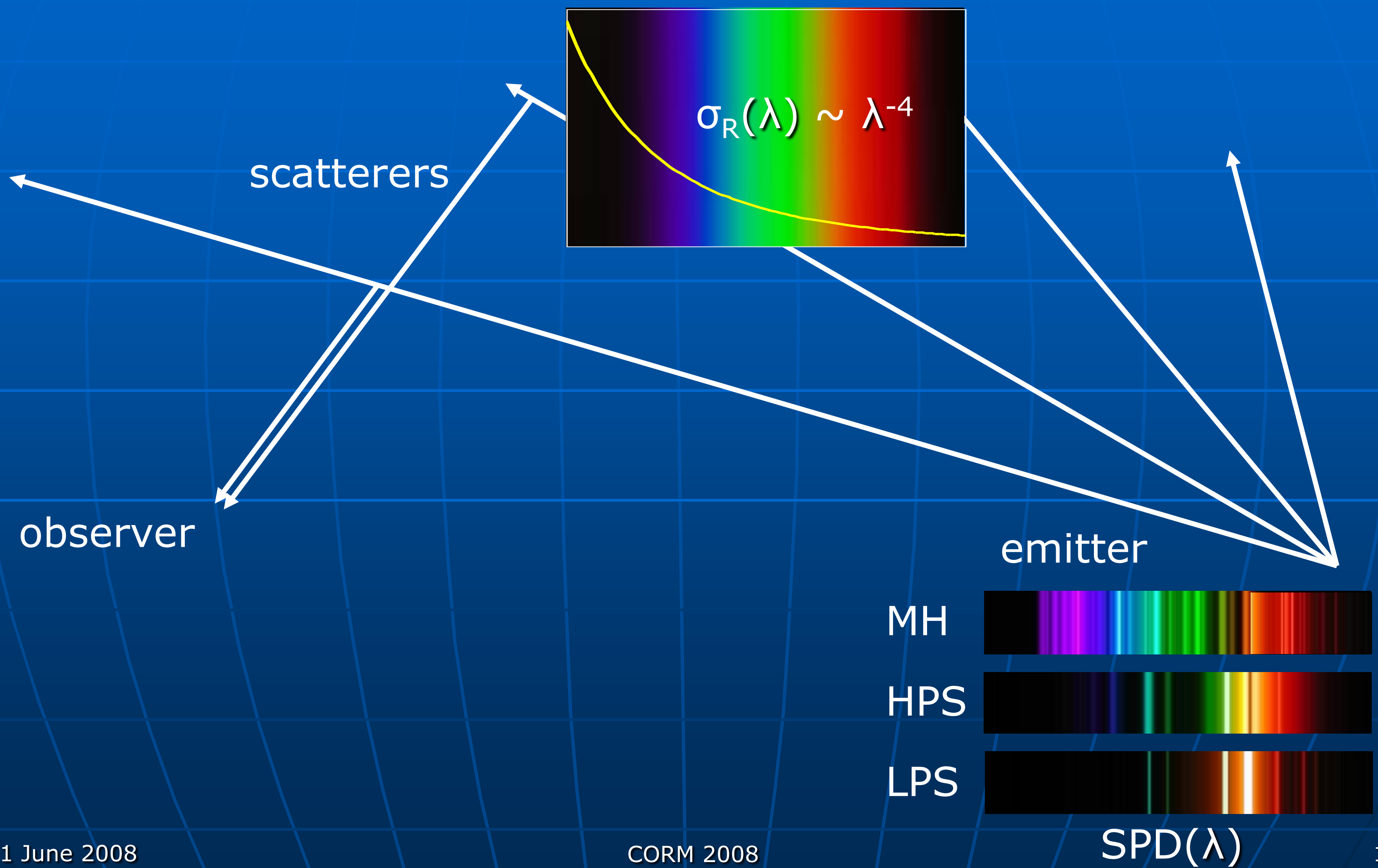

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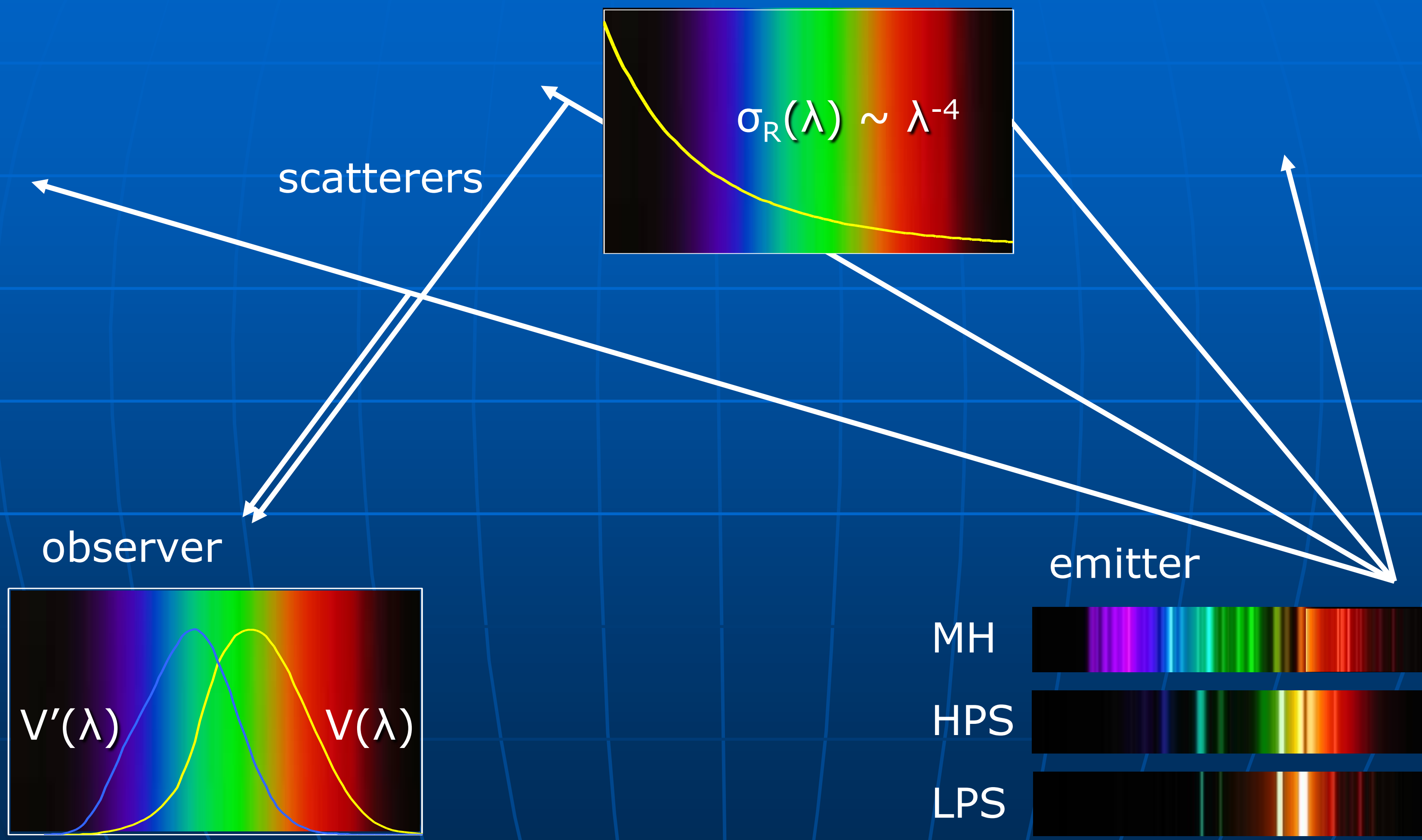

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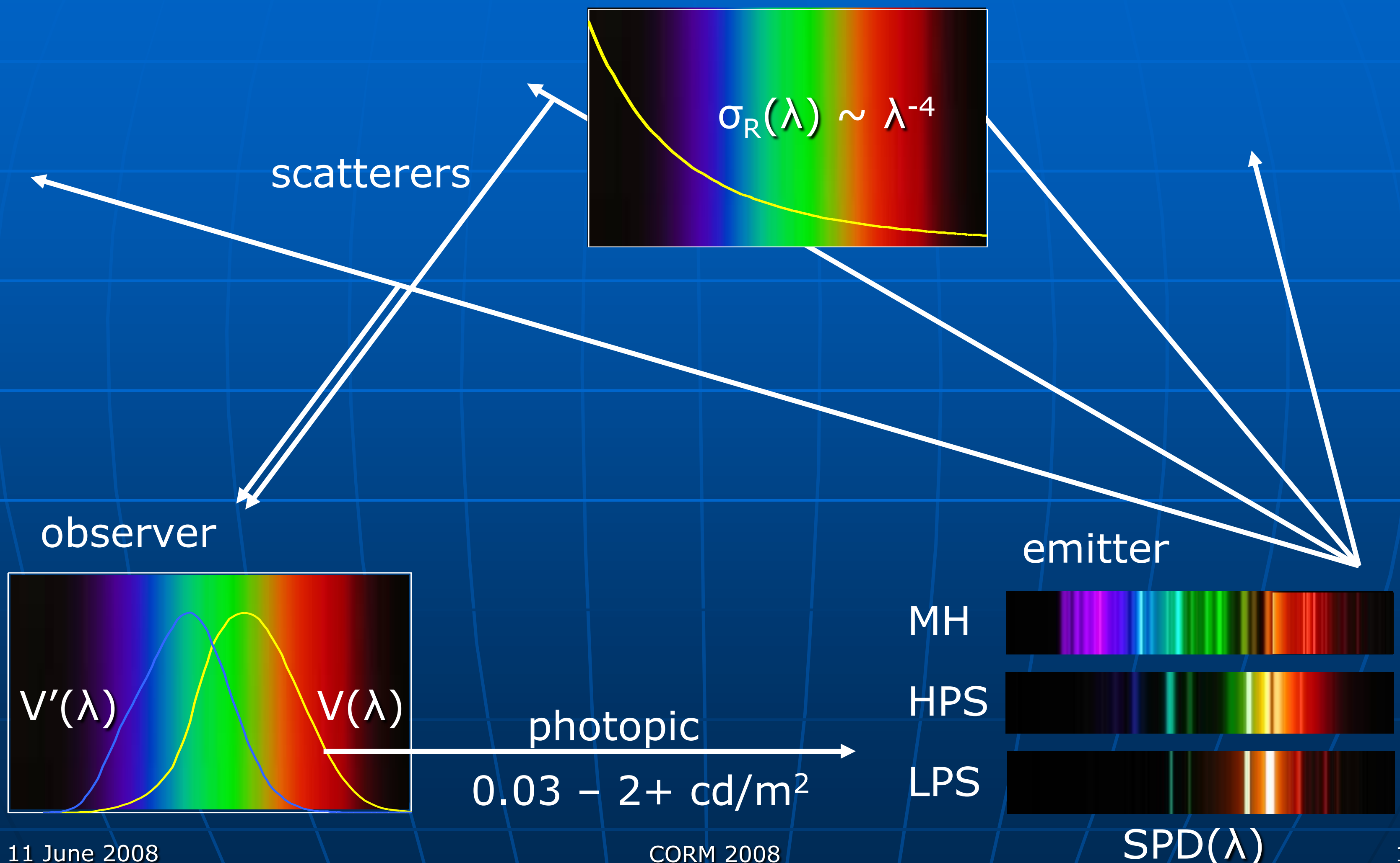

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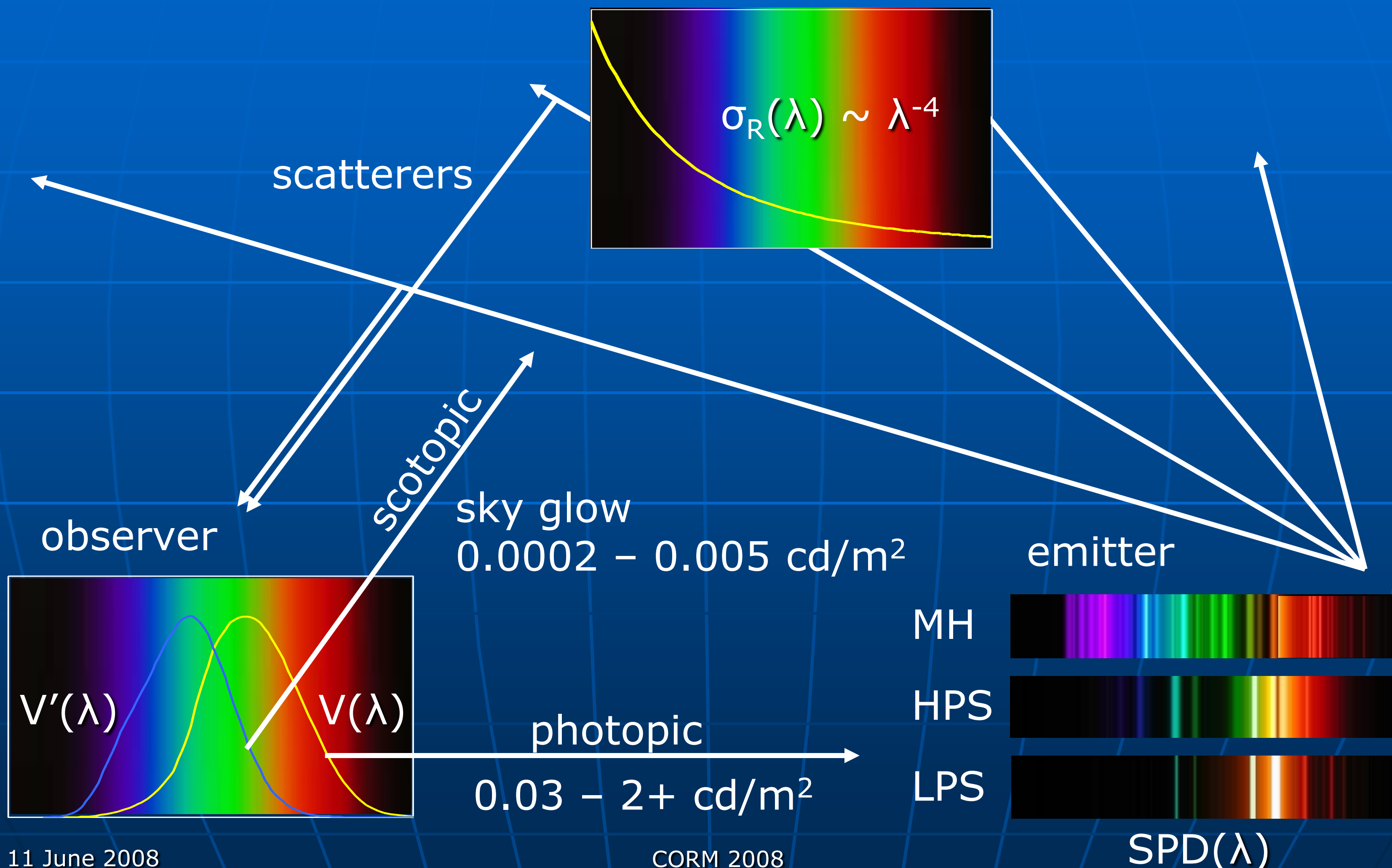
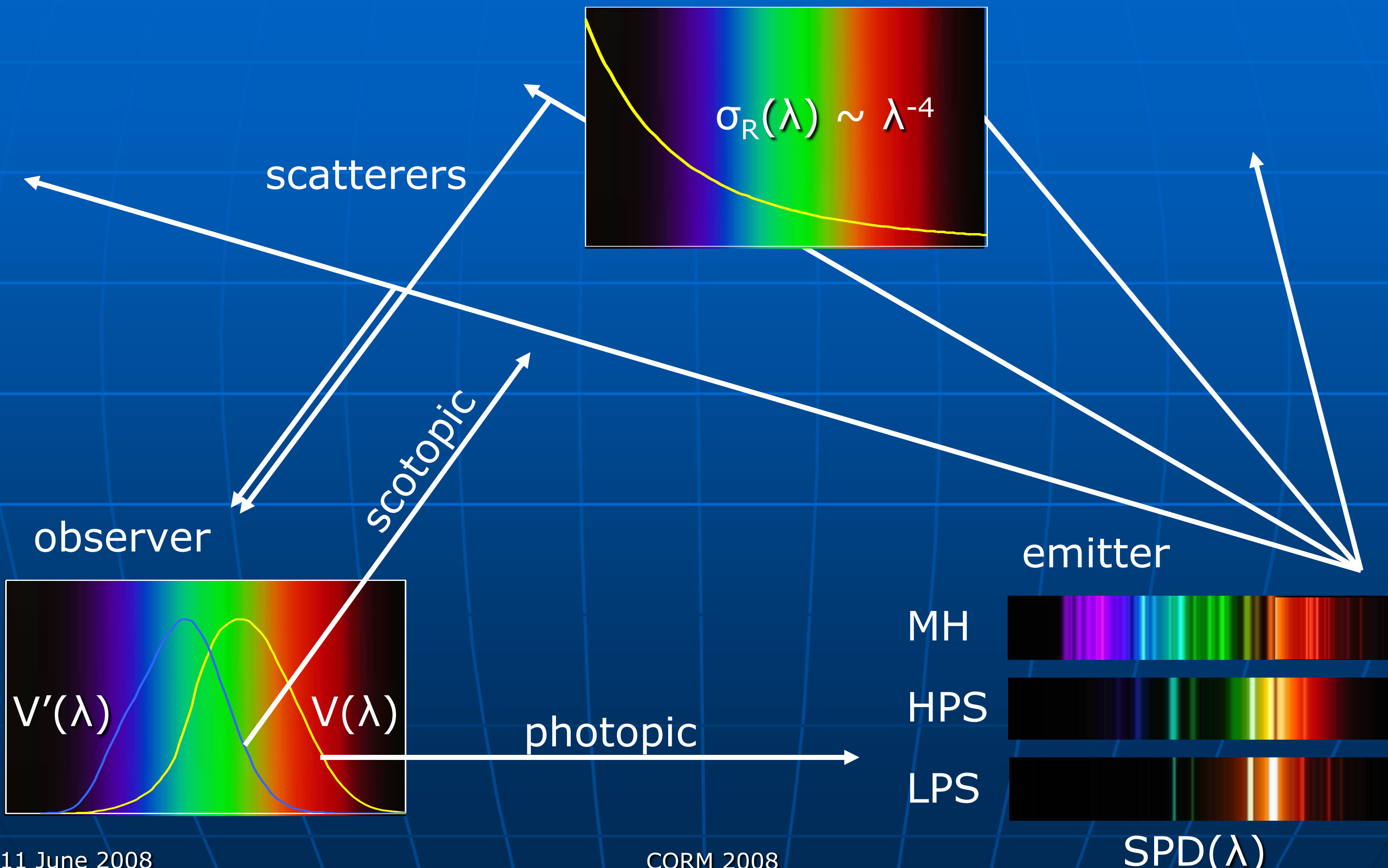


Sky Glow

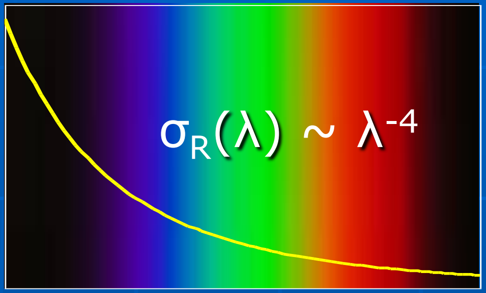
$$RSI \sim \int SPD(\lambda)\ \sigma_R(\lambda)\ d\lambda$$

$$b \sim \int SPD(\lambda)\ \sigma_R(\lambda)\ V'(\lambda)\ d\lambda$$

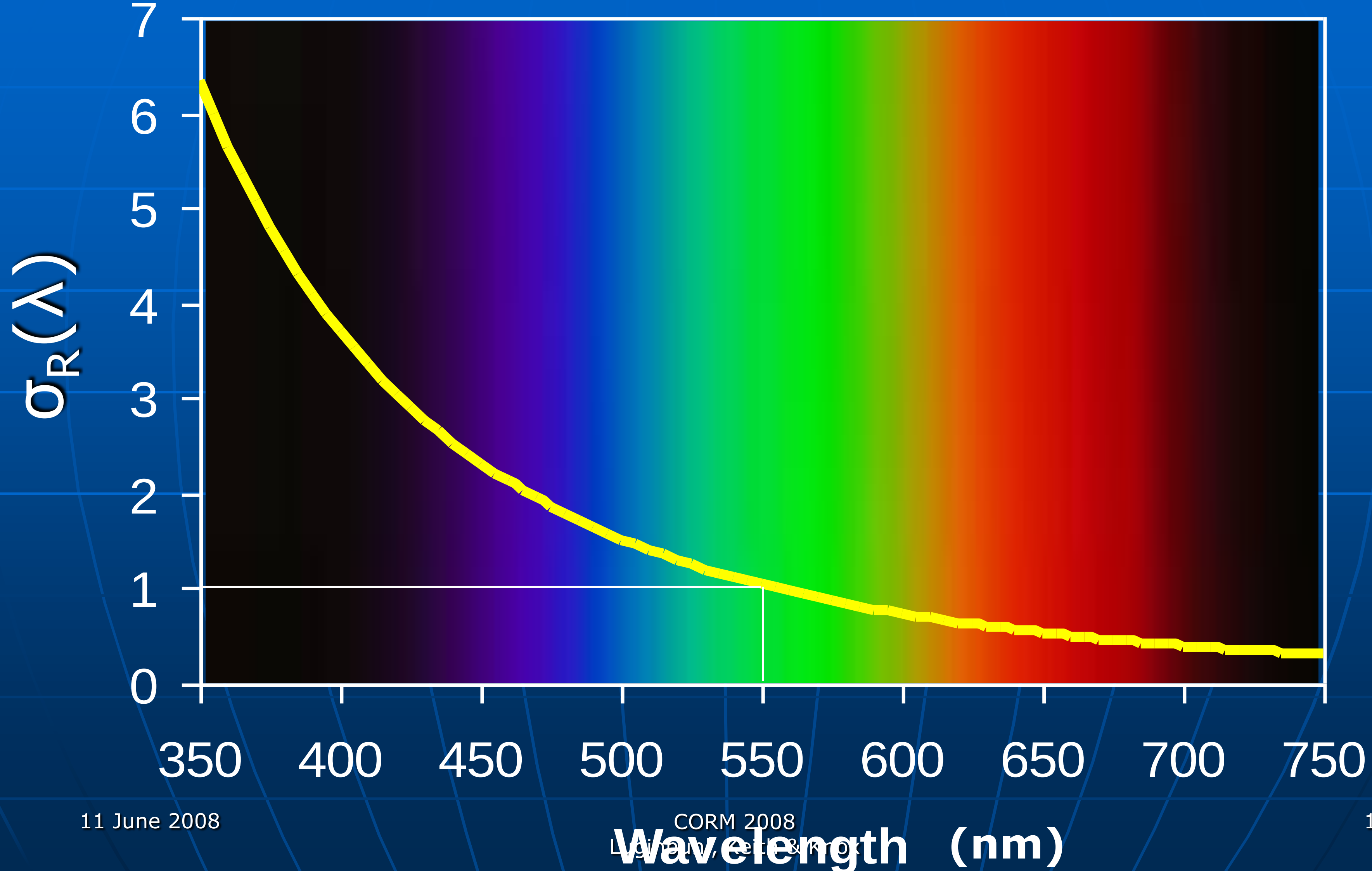
Light Pollution



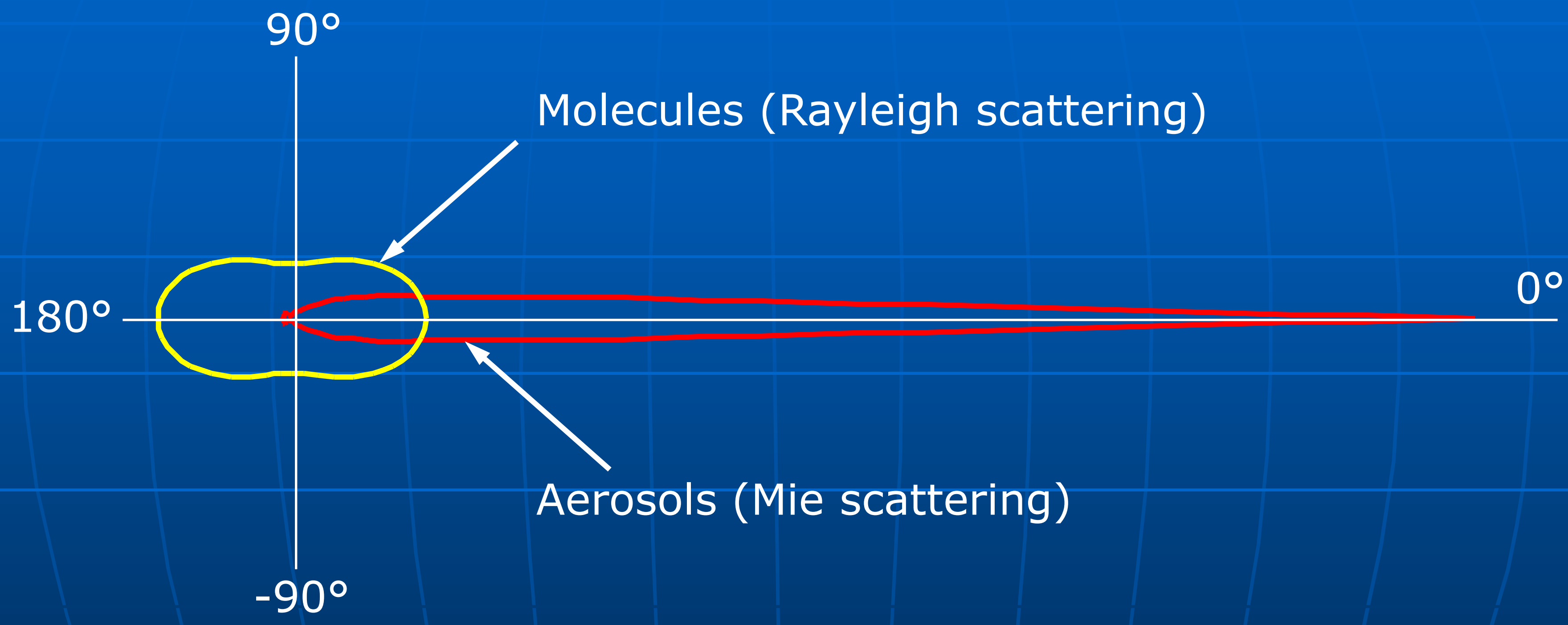
Rayleigh scattering



Rayleigh scattering

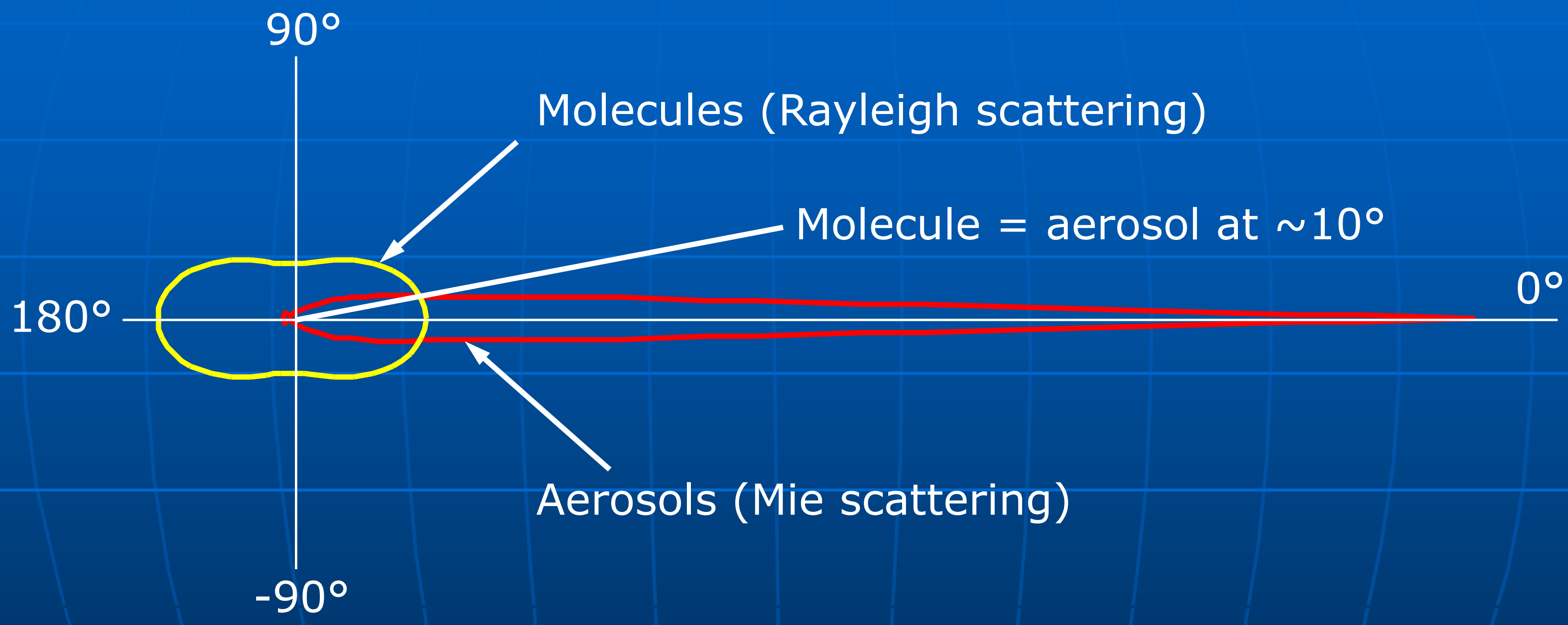


Scattering angles



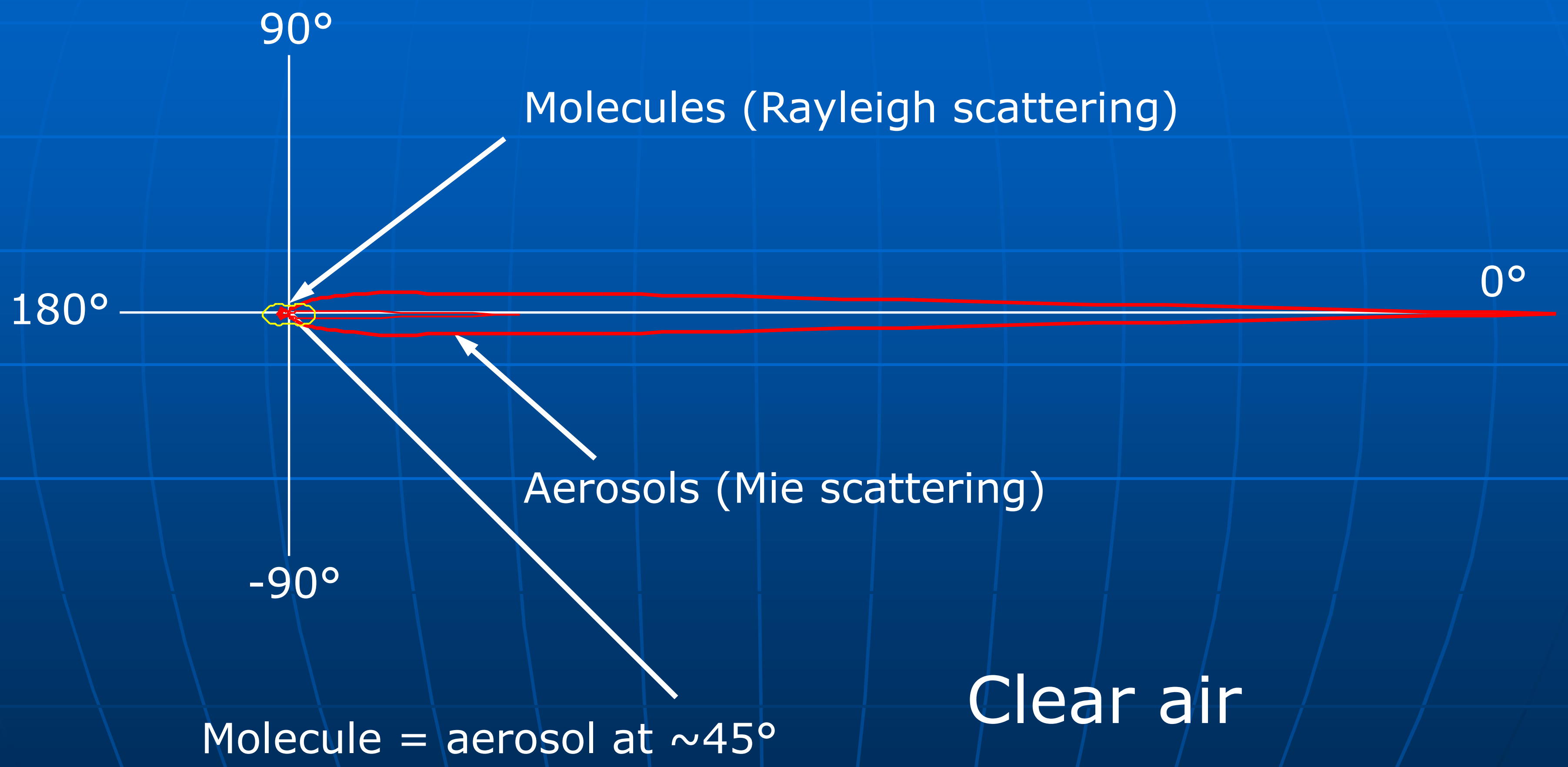
Pristine air

Scattering angles



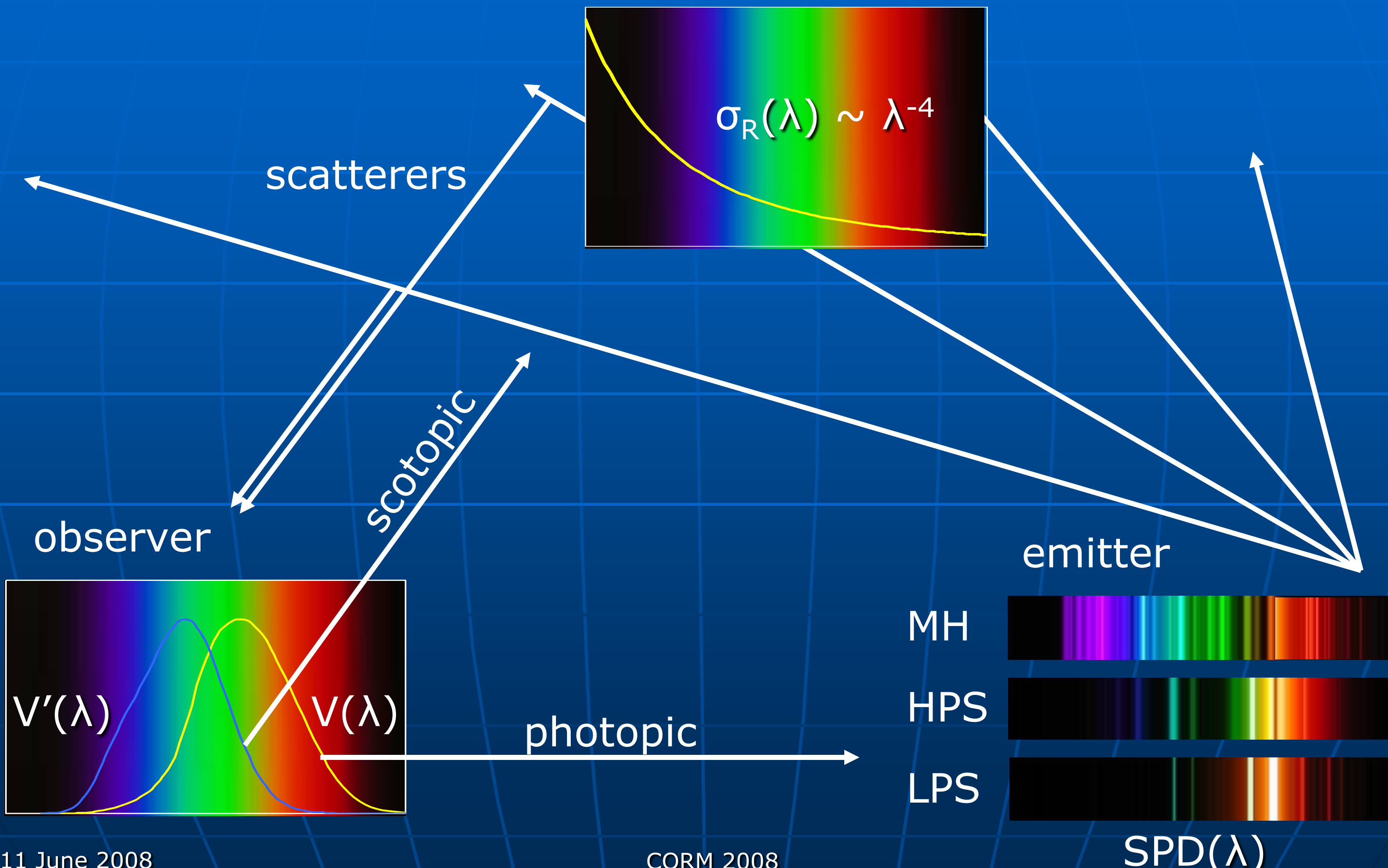
Pristine air

Scattering angles

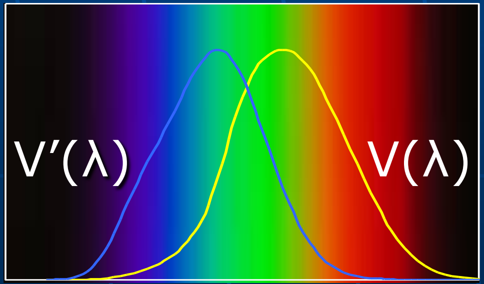


Clear air

Light Pollution



Visual Response



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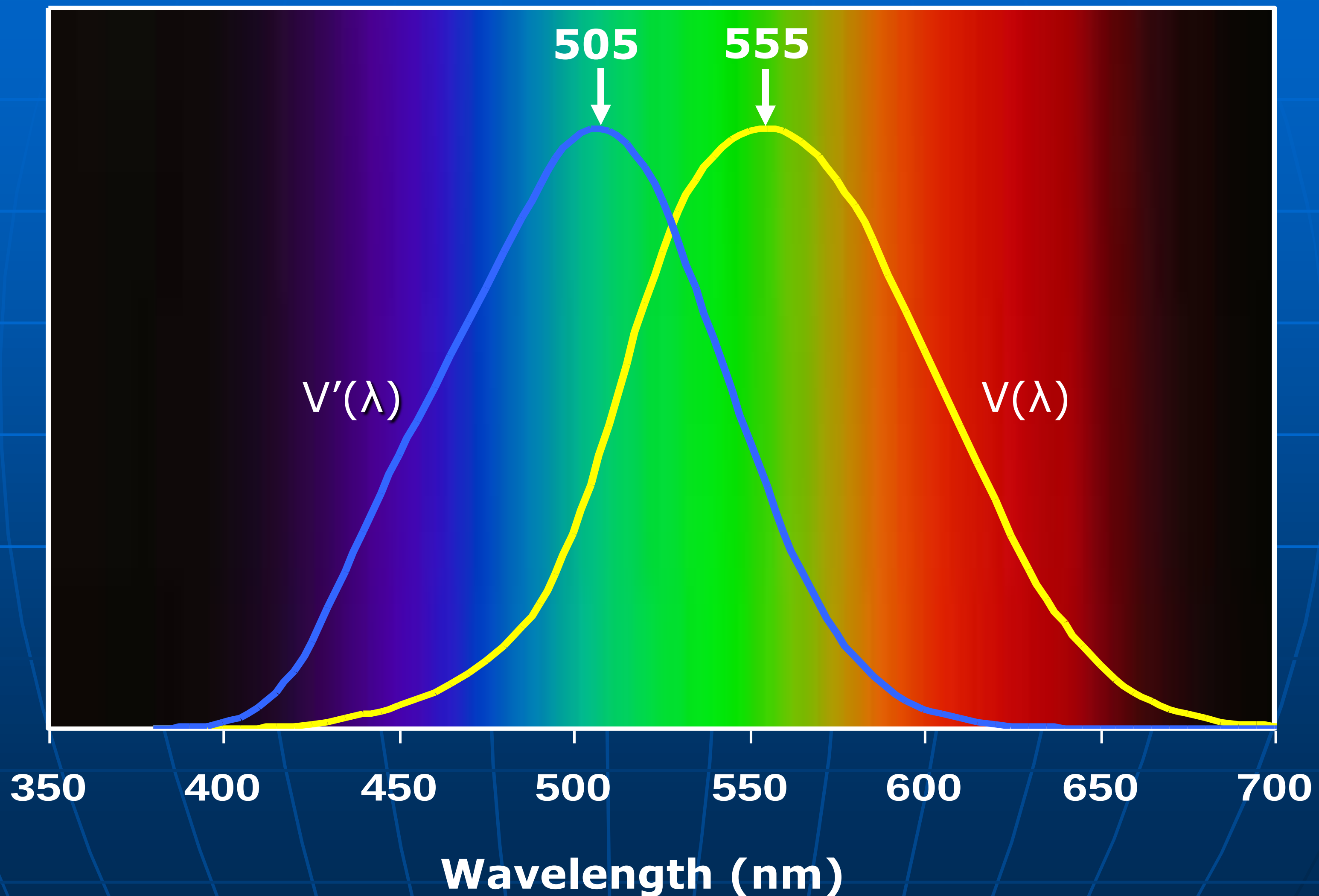

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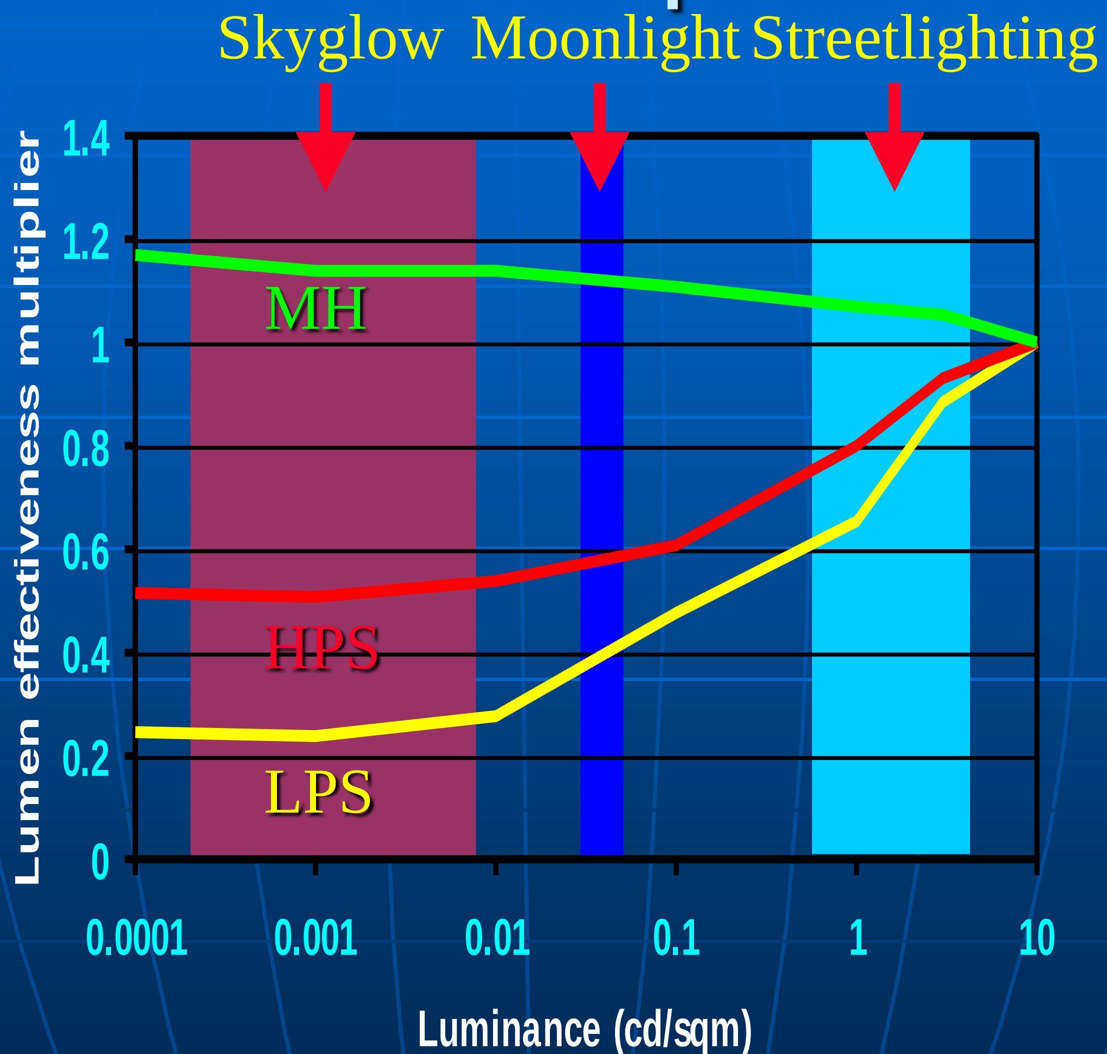
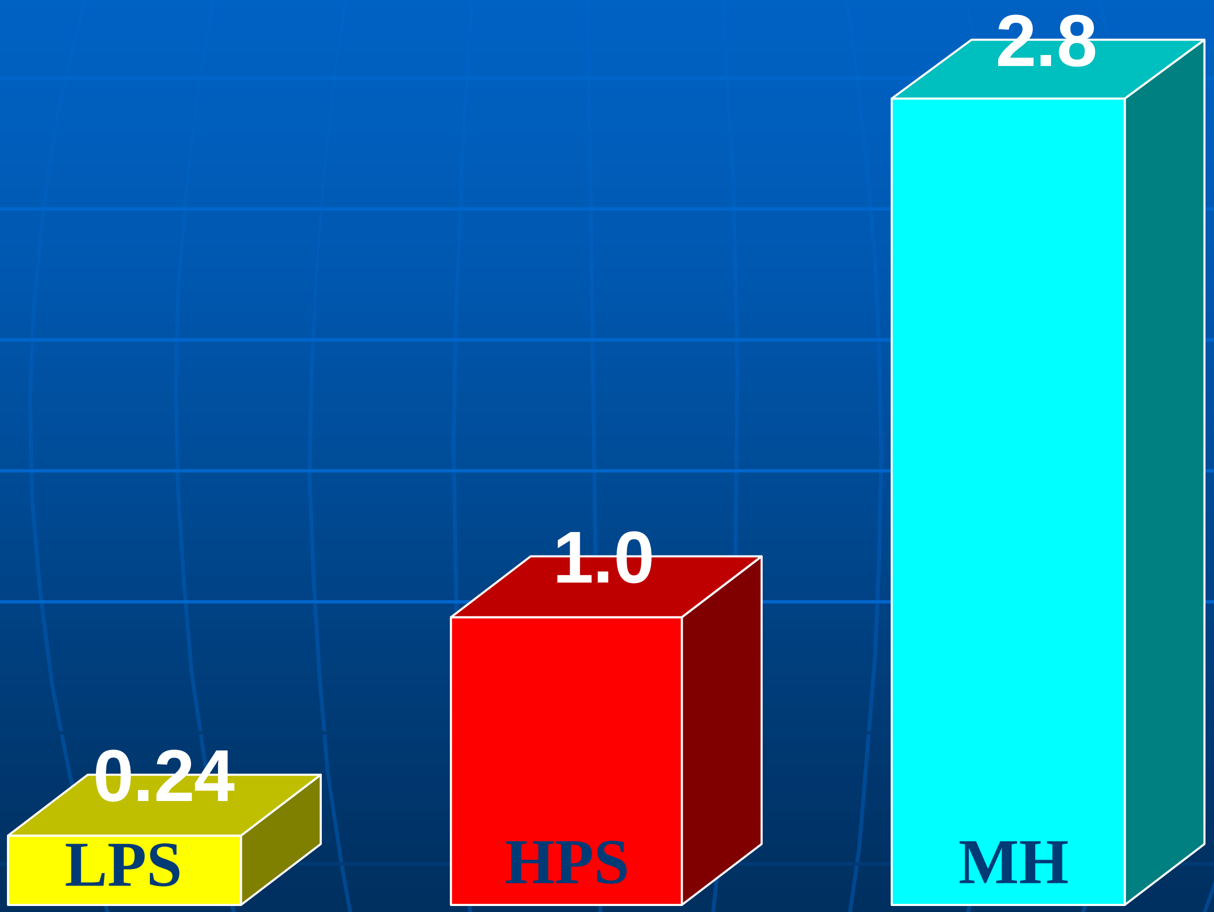


Relative Sky Glow



Conclusions

- Rayleigh scattering by molecules in the atmosphere and scotopic visual response greatly increase the impact of blue-rich light sources on "sky glow" light pollution.
- In clear air and when looking overhead, lumen-for-lumen metal halide lighting can have 2.8x the impact of HPS, and 12x that of LPS.

References and further reading…

- Keith & Knox, 2003, International Dark-Sky Assoc. (IDA) general meeting
- Luginbuhl, 2003, IDA general meeting
- Duriscoe, Luginbuhl & Moore, 2007, Pub. Astronomical Soc. Pacific, vol. 119, pg. 192
- Rea & Boyce, 1999, 4th EPRI/LRO Symposium pg. 101
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