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Základy KOLORISTIKY

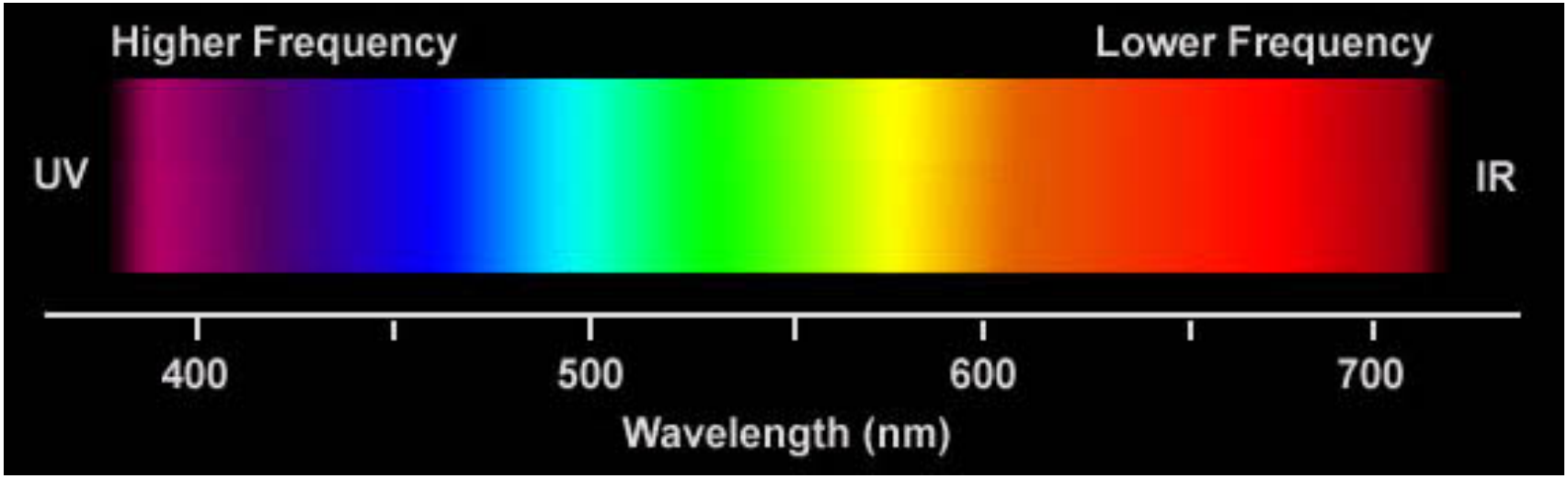
Lektor: doc. Ing. Michal Vik, Ph.D.
doc. Ing. Martina Viková, Ph.D.

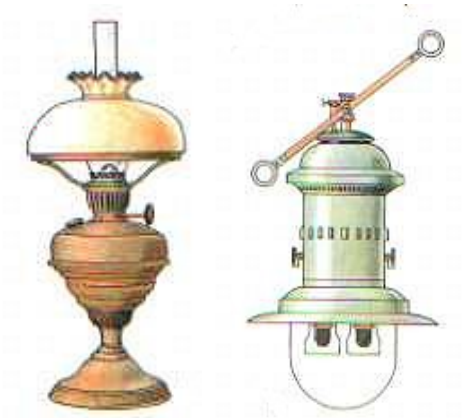
EVROPSKÁ UNIE
Evropské strukturální a investiční fondy
Operační program Výzkum, vývoj a vzdělávání

MINISTERSTVO ŠKOLSTVÍ, MLÁDEŽE A TĚLOVÝCHOVY

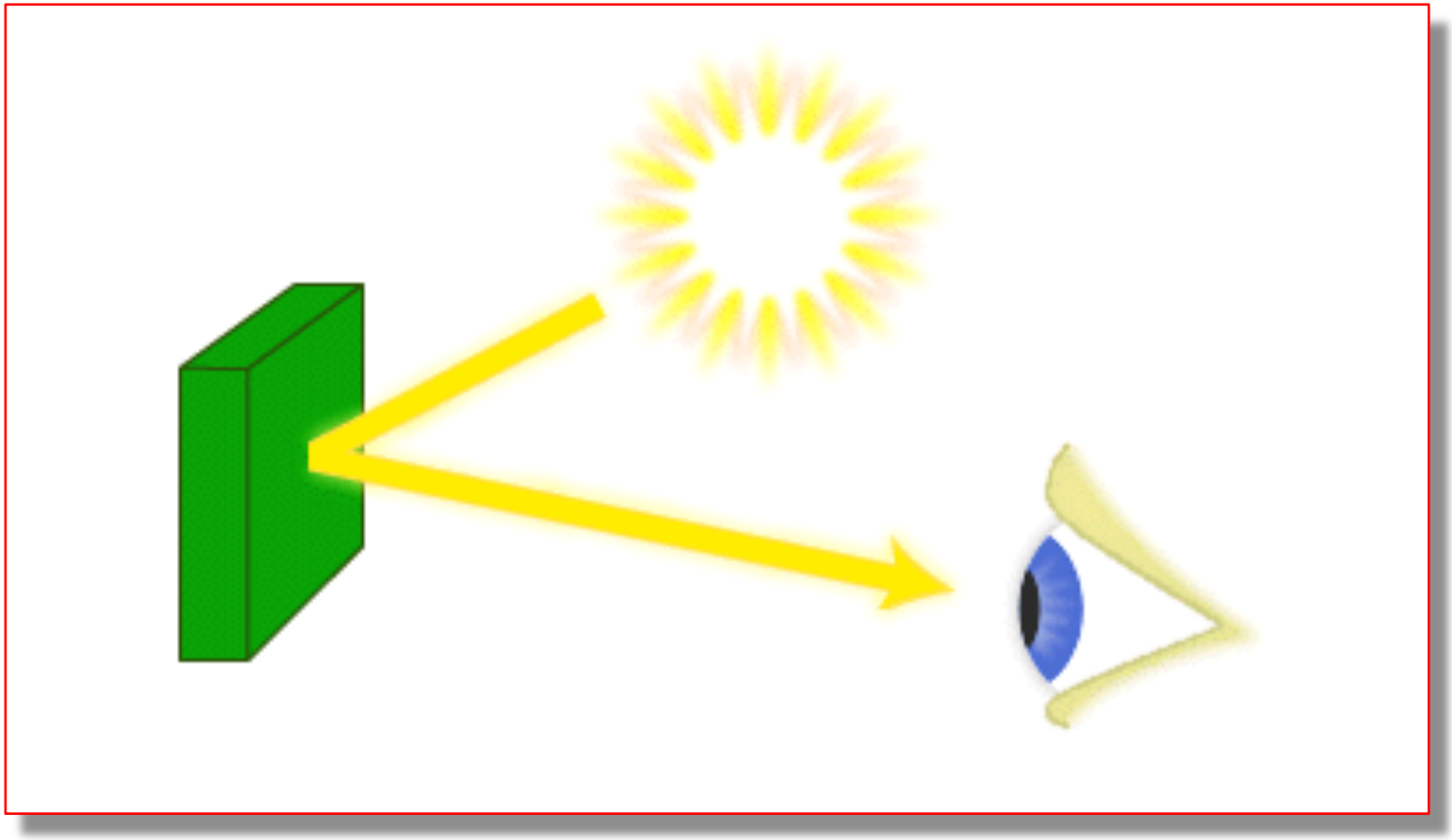
CZ.02.2.69/0.0/0.0/16_015/0002329

Osvětlení

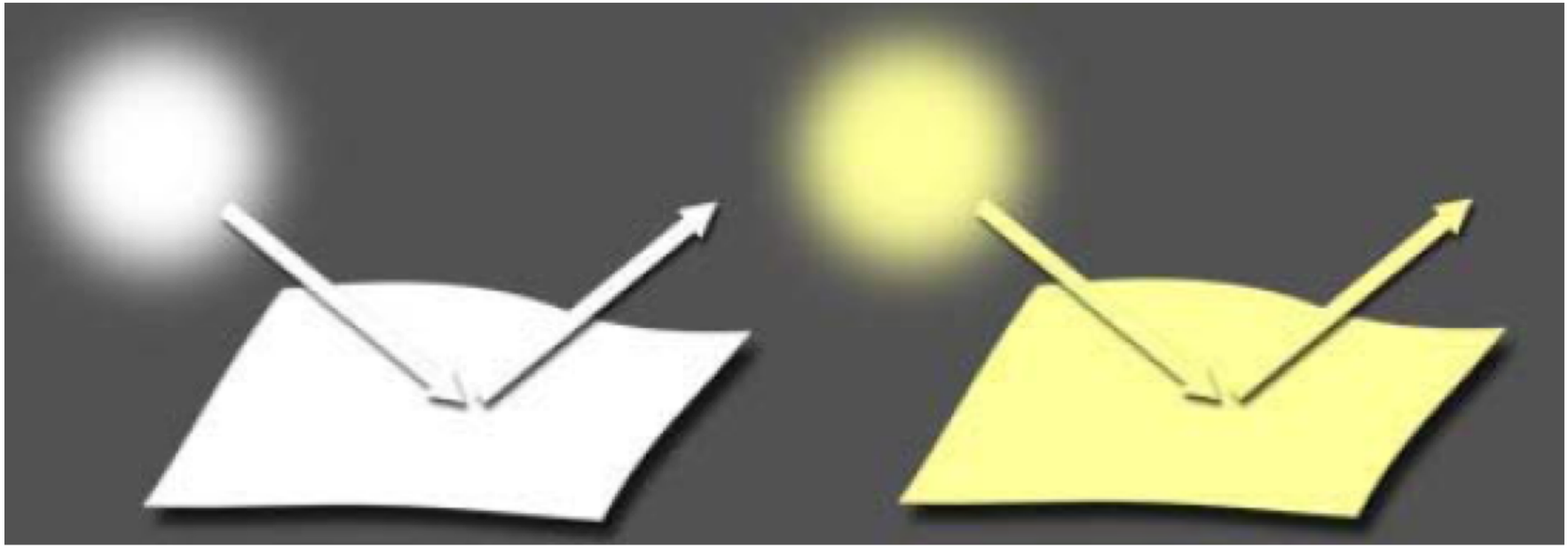

Higher Frequency
Lower Frequency
UV
IR
400
500
600
700
Wavelength (nm)



Vizuální triplet



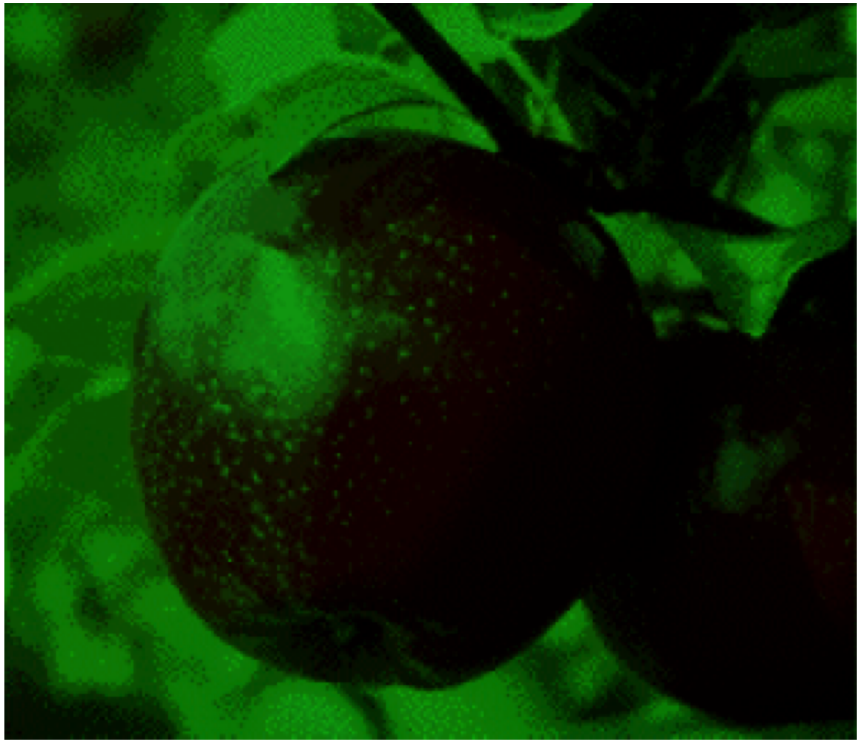
Vliv spektrálního složení osvětlení I



Bílý papír není bílý. Má vždy barvu světla,
které na něj svítí

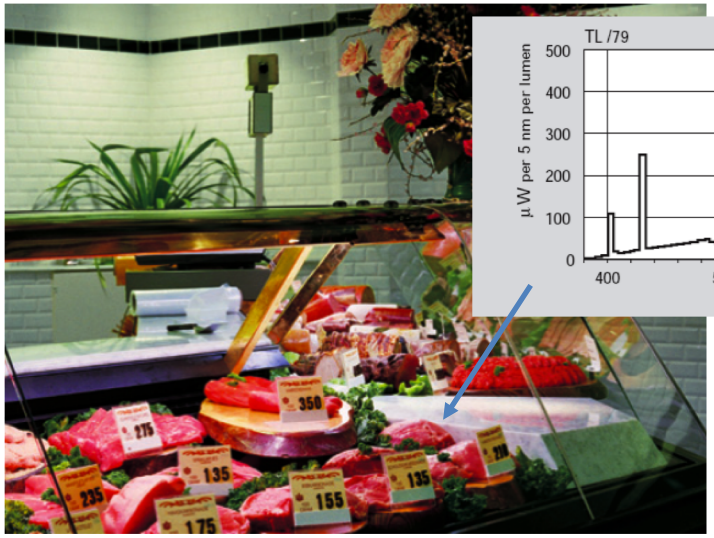
Vliv spektrálního složení osvětlení II

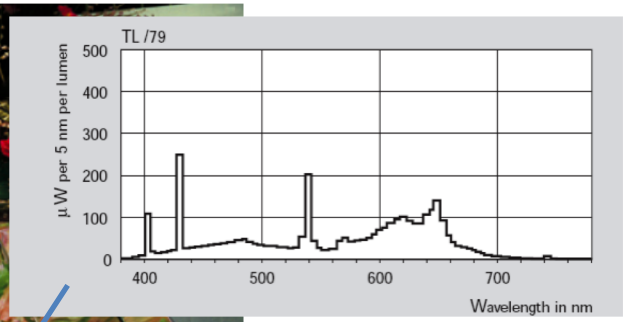
Bílé denní světlo



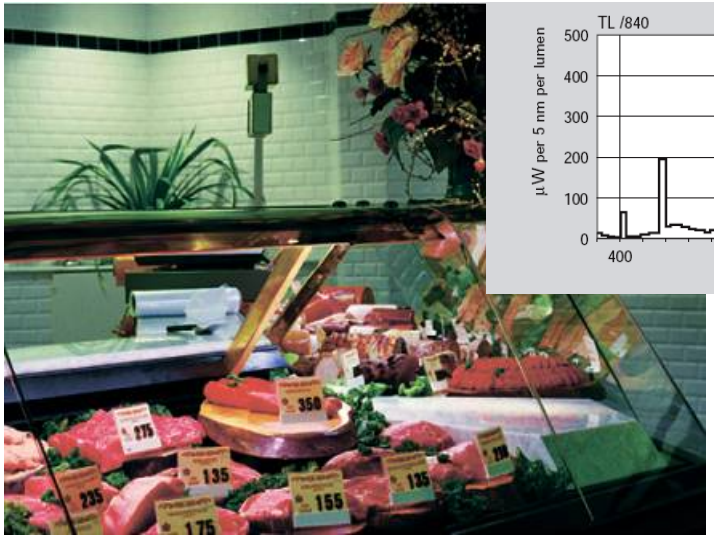
Zelené světlo

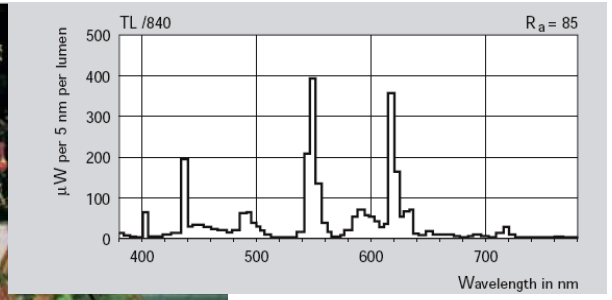
Vliv spektrálního složení osvětlení III



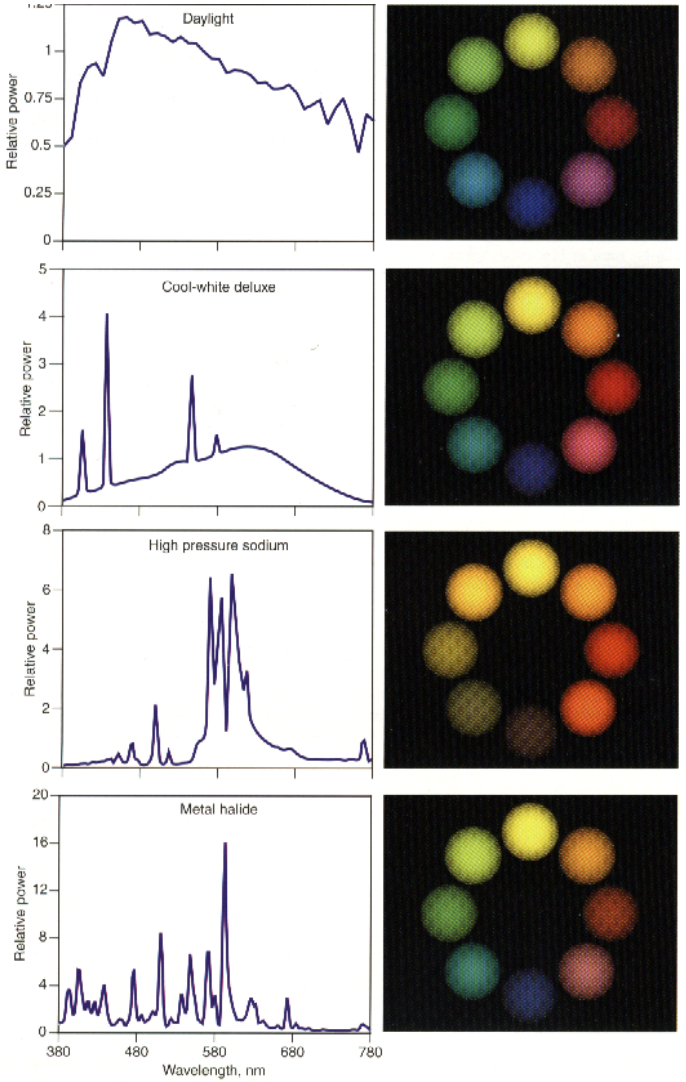


T_{CP}=3800K

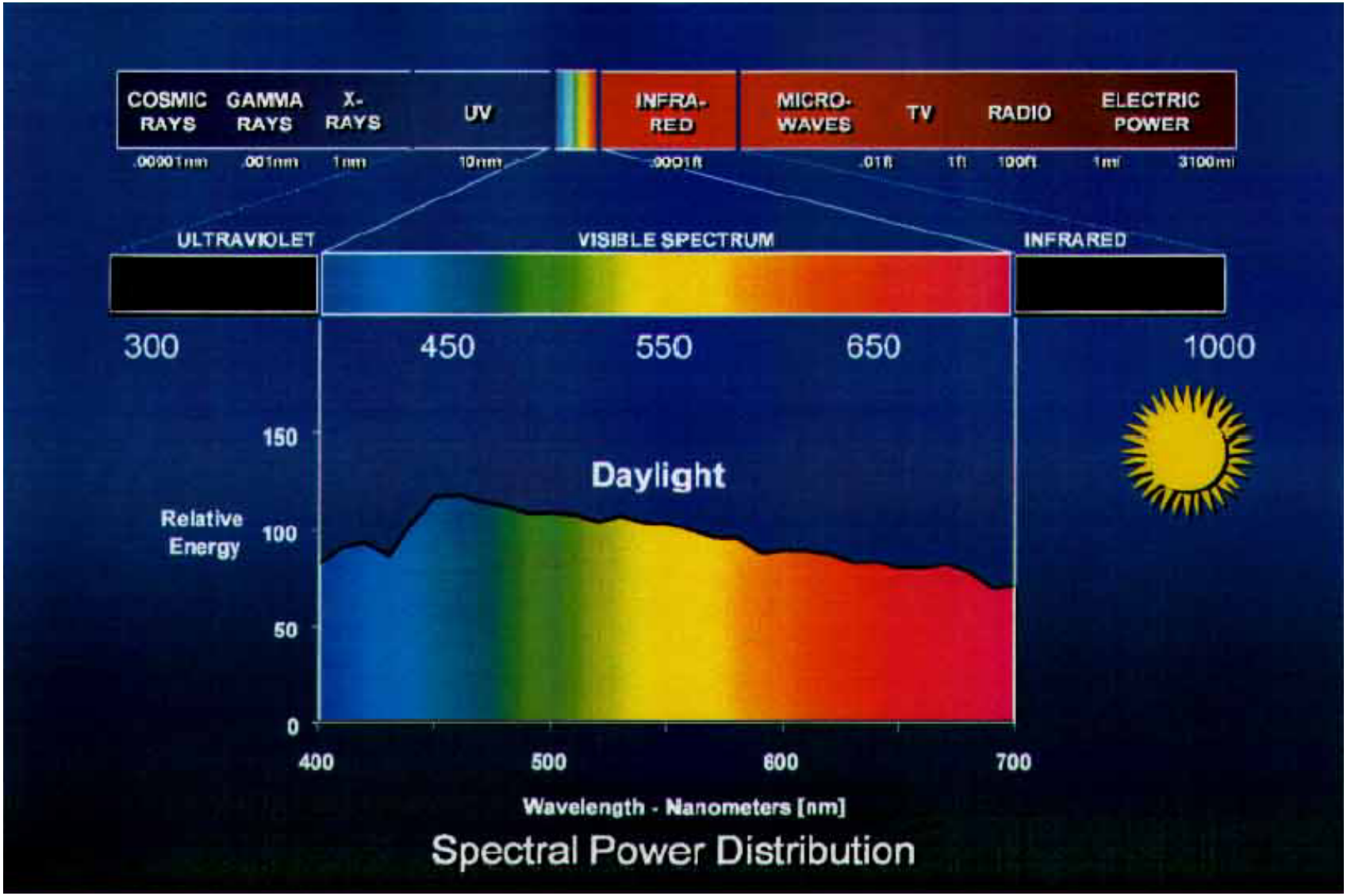




T_{CP}=4100K

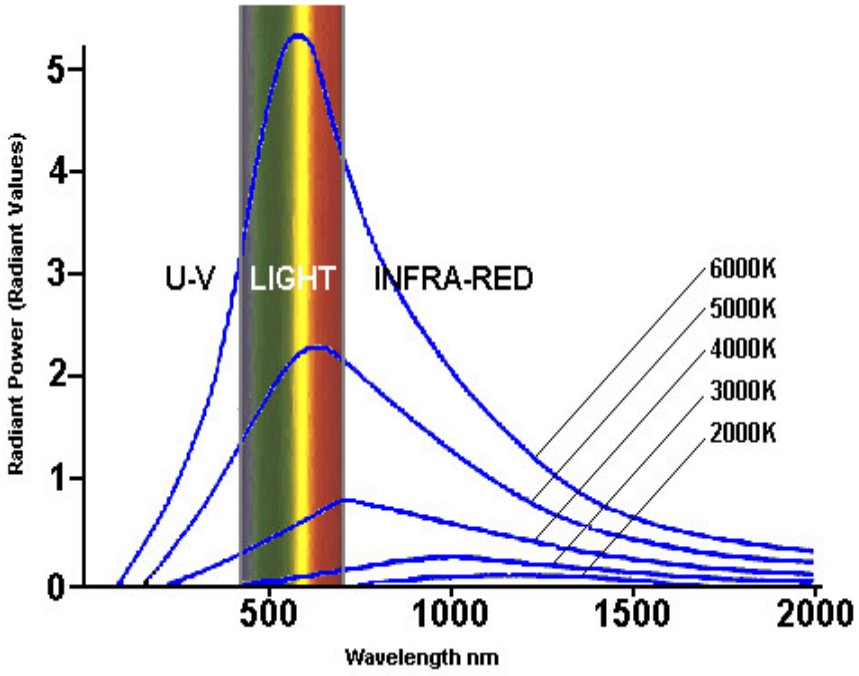


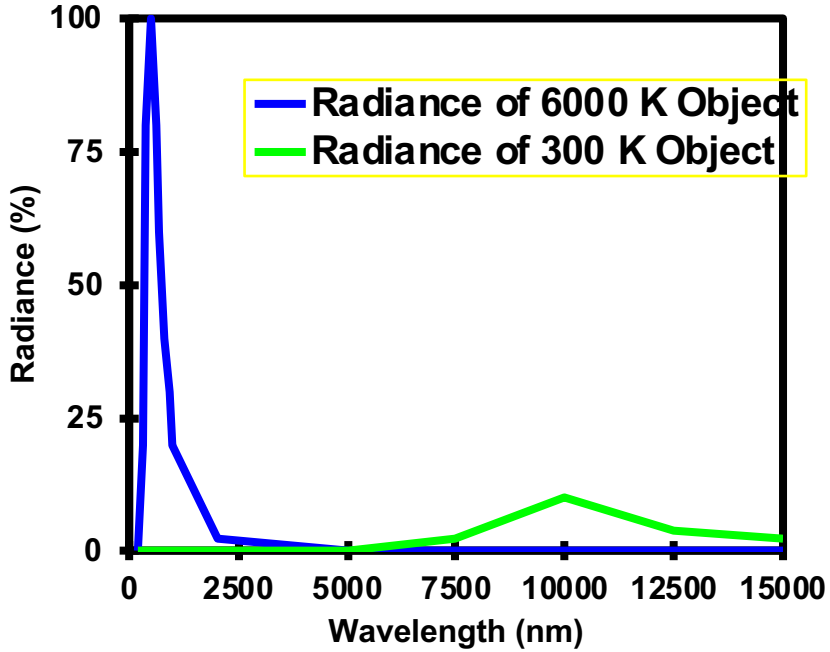
Vizuální část spektra



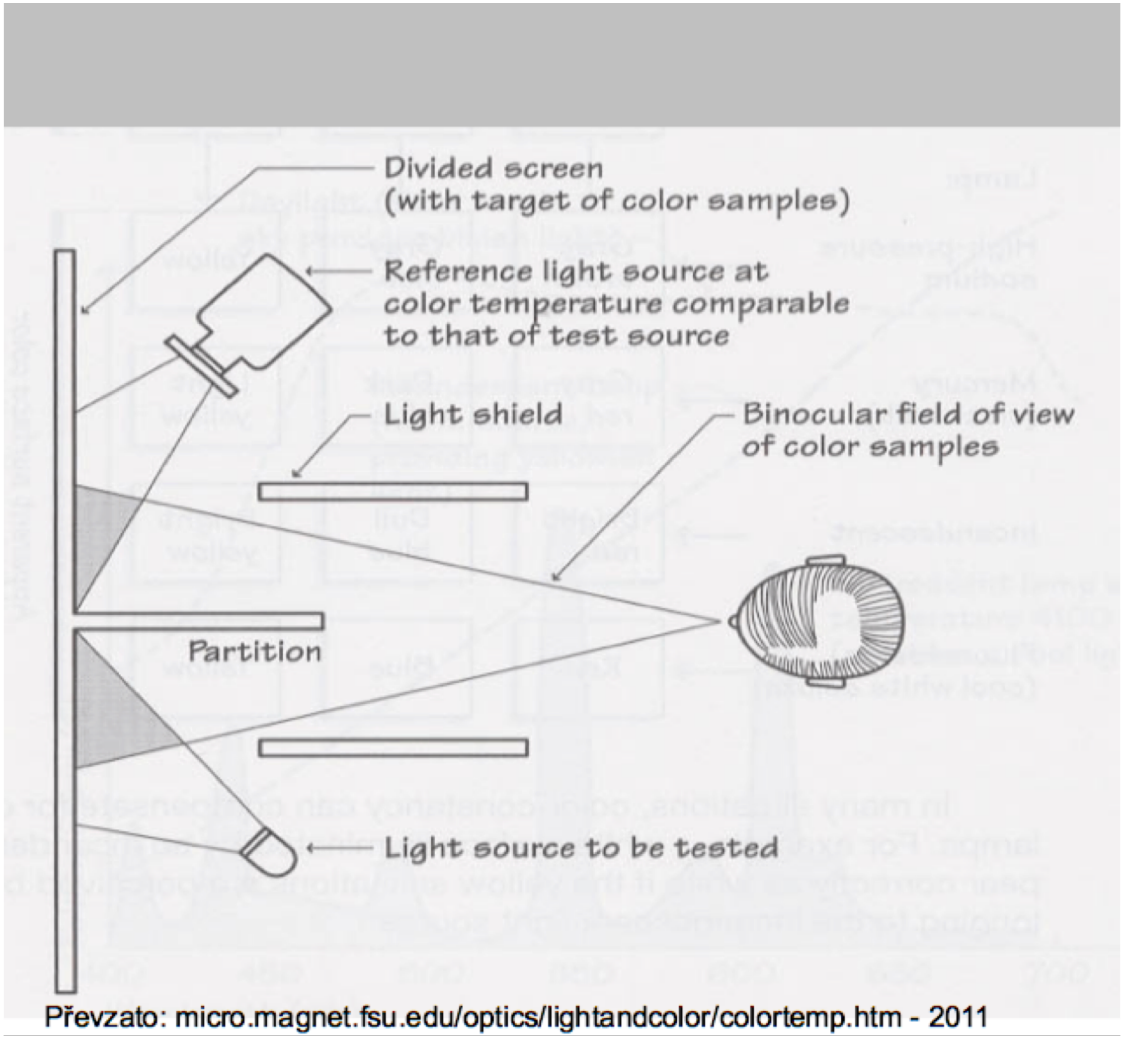
Planckův zákon

$$E_\lambda = \frac{2\pi c^2 h}{\lambda^5} \frac{1}{e^{hc/k\lambda T} - 1} = f(T, \lambda)$$

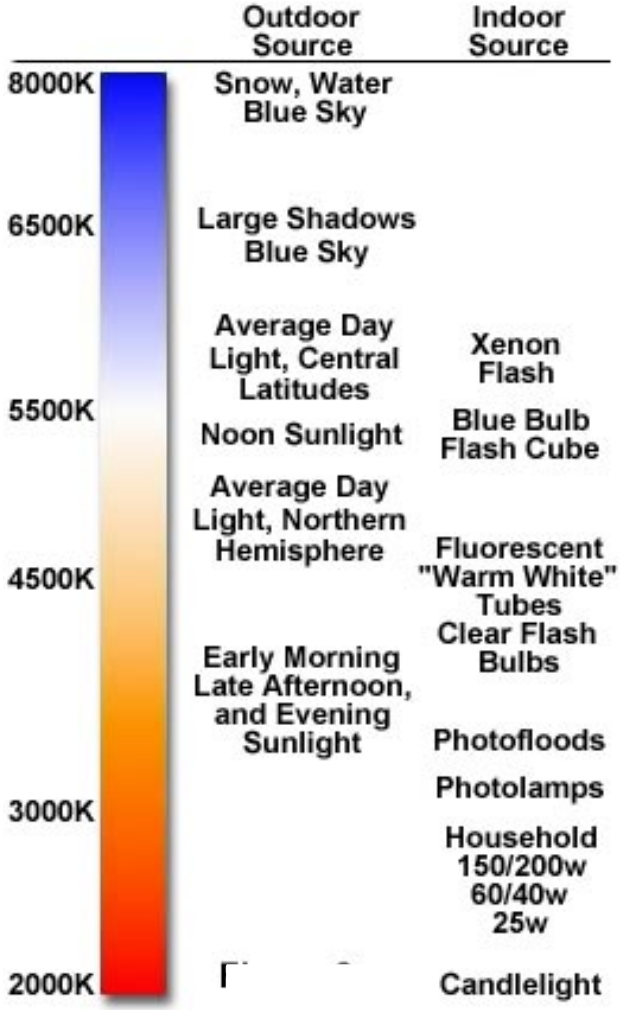




Teplota chromatičnosti I



Převzato: micro.magnet.fsu.edu/optics/lightandcolor/colortemp.htm - 2011



Teplota chromatičnosti II

Correlated colour temperature (CCT)	Colour appearance
< 3300K	Warm
3300 - 5300K	Intermediate
> 5300K	Cool

Light Source	Illuminant	Color Temperature
Daylight	D65	6500 Kelvin
Average Daylight	D50	5000 Kelvin
Daylight Old std.	C	6774 Kelvin
Incandescent	A	2856 Kelvin
Direct Sun	B	4874 Kelvin

Převzato: micro.magnet.fsu.edu/optics/lightandcolor/colortemp.htm - 2011

Světelné zdroje

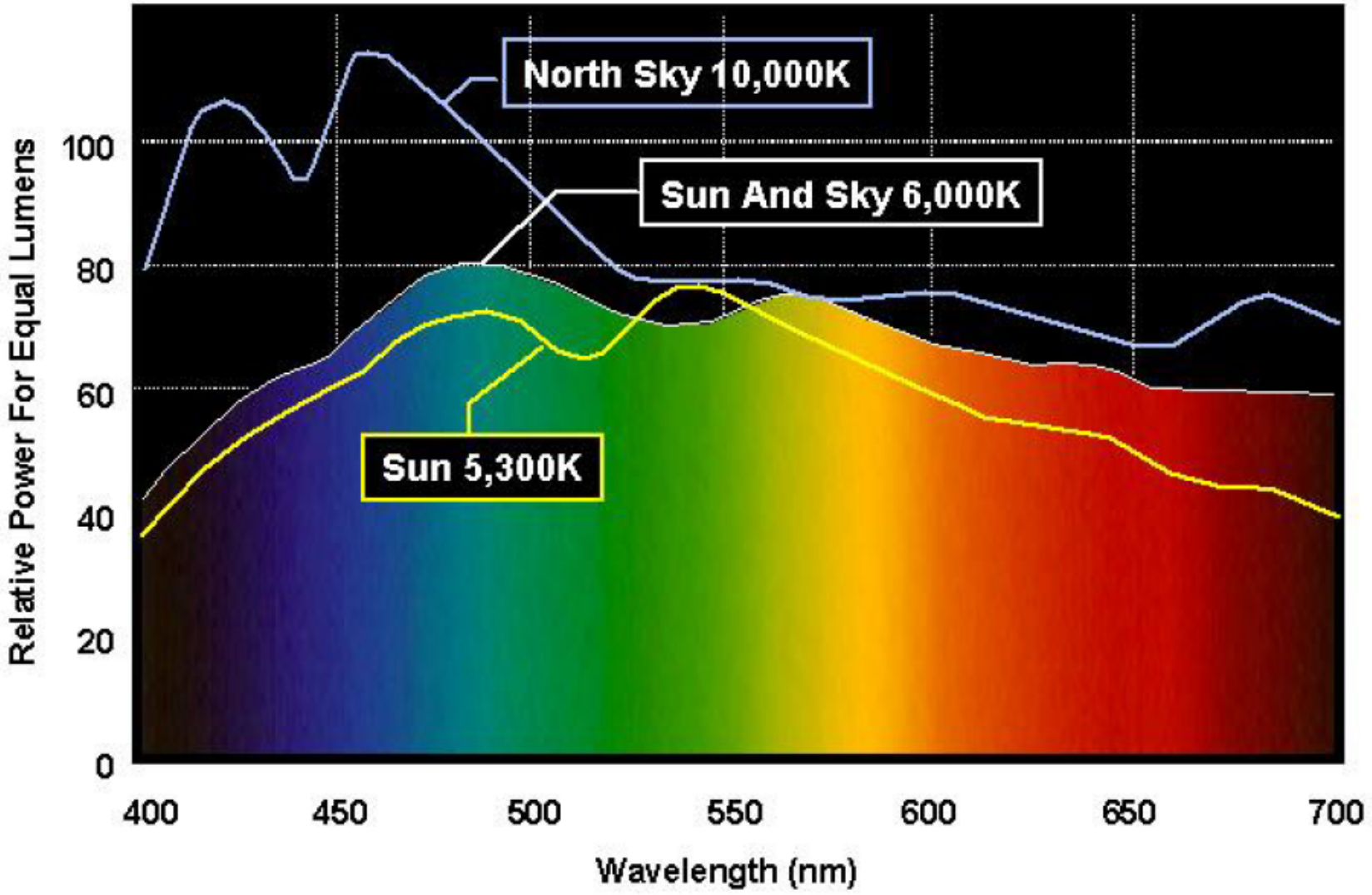




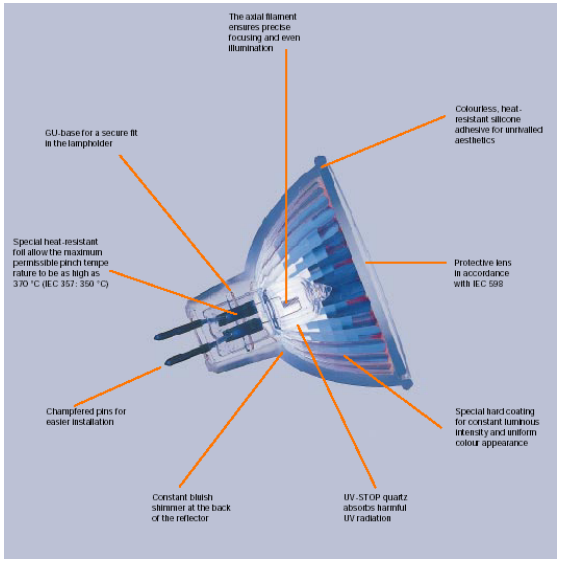




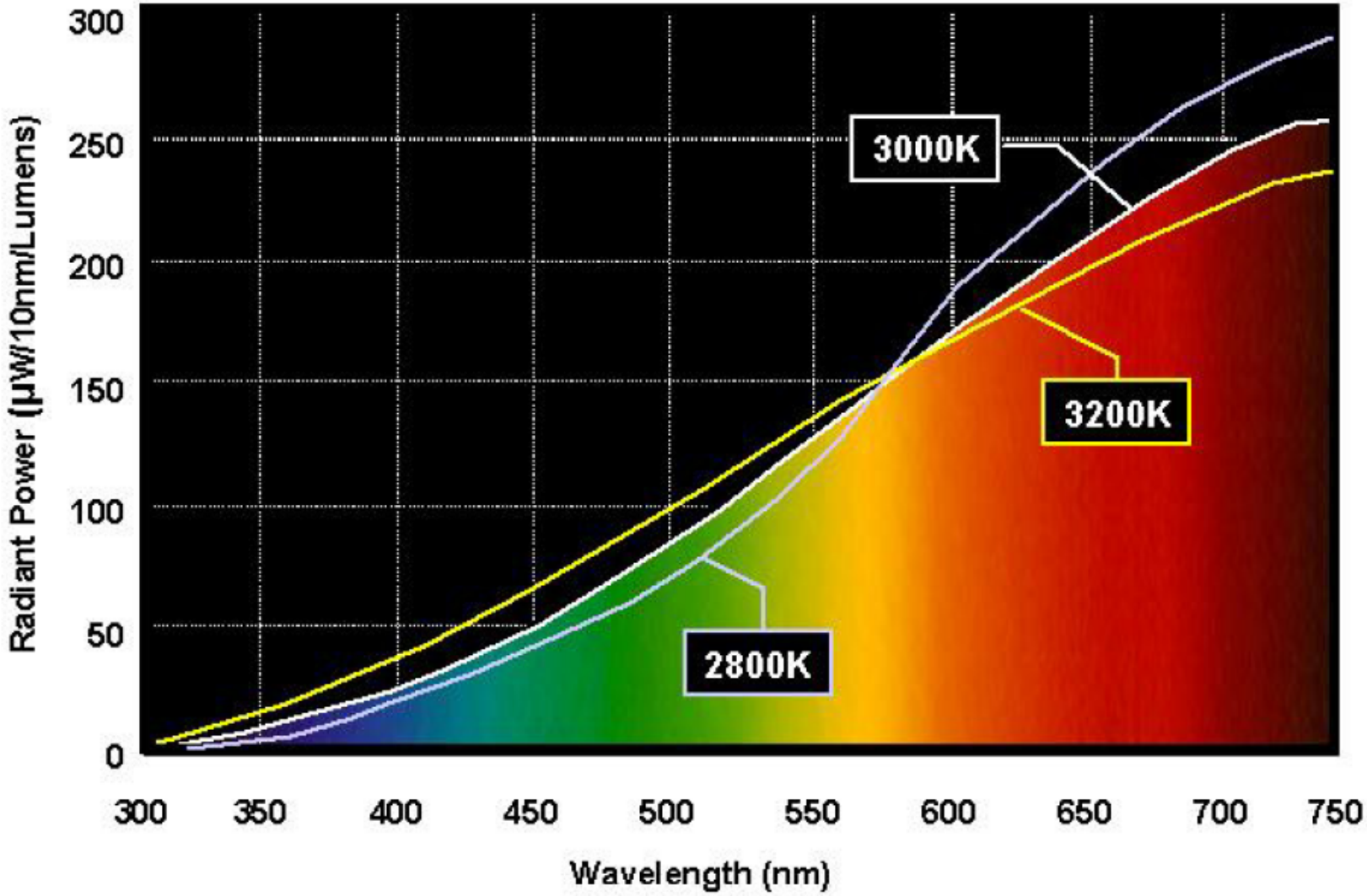
Denní světlo



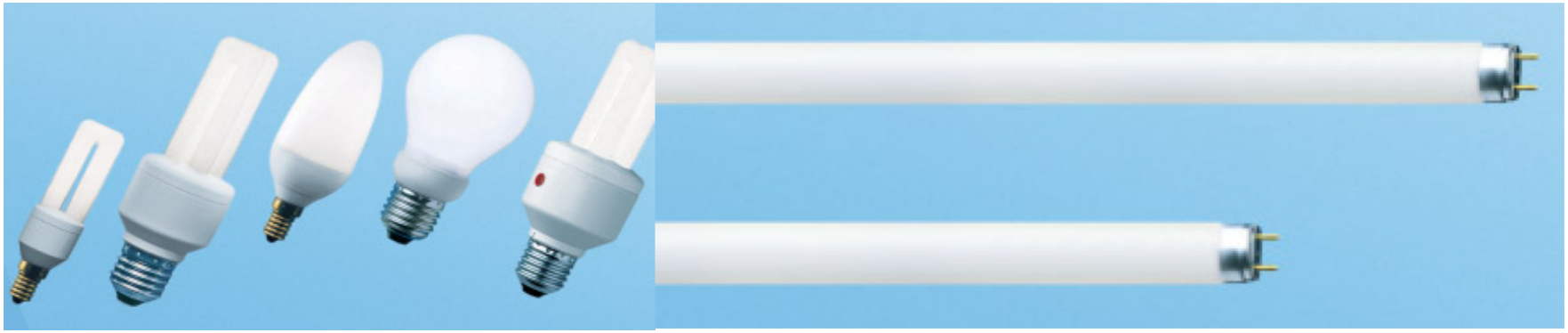
Žárovkové osvětlení I

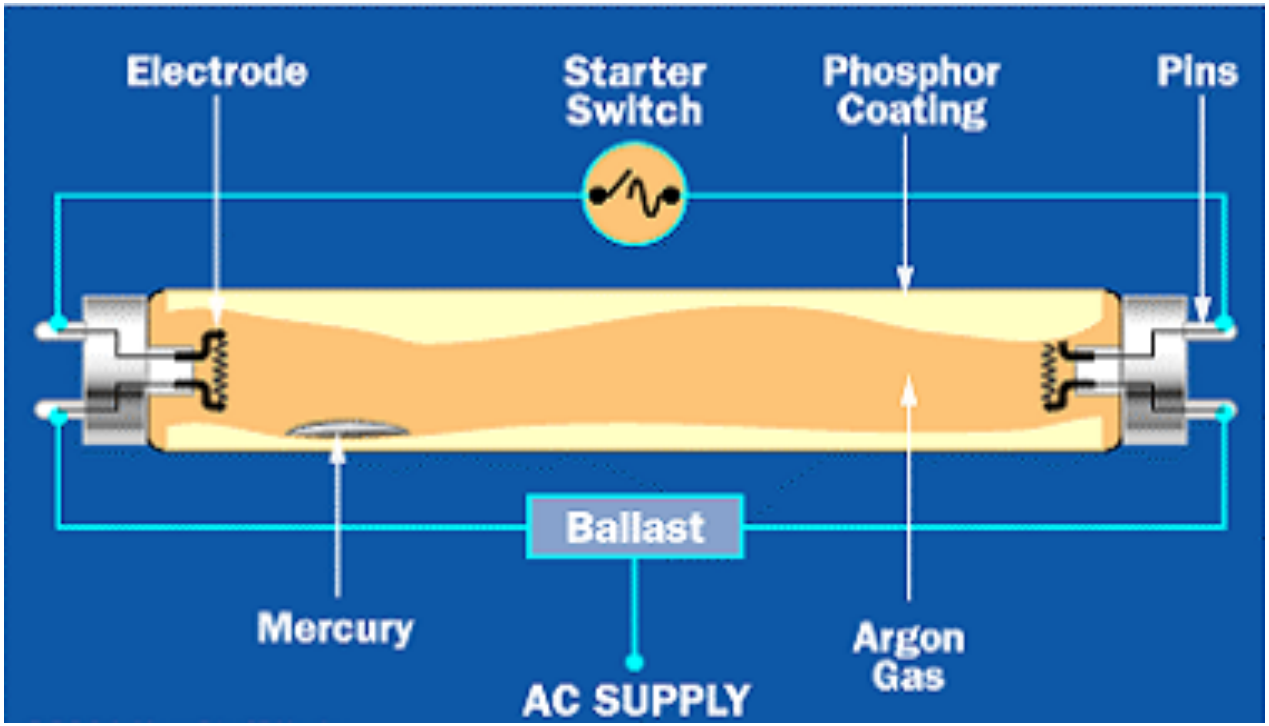


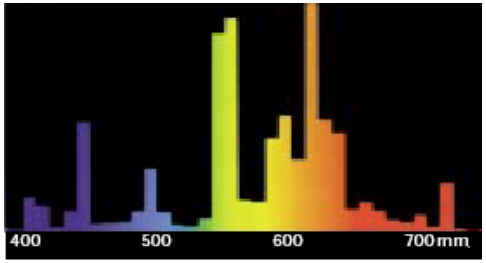
Žárovkové osvětlení II

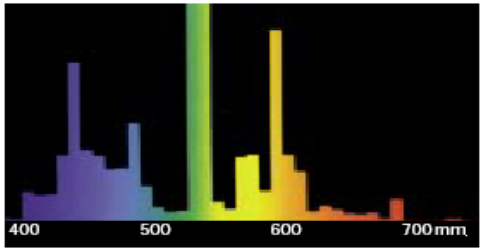


Zářivky

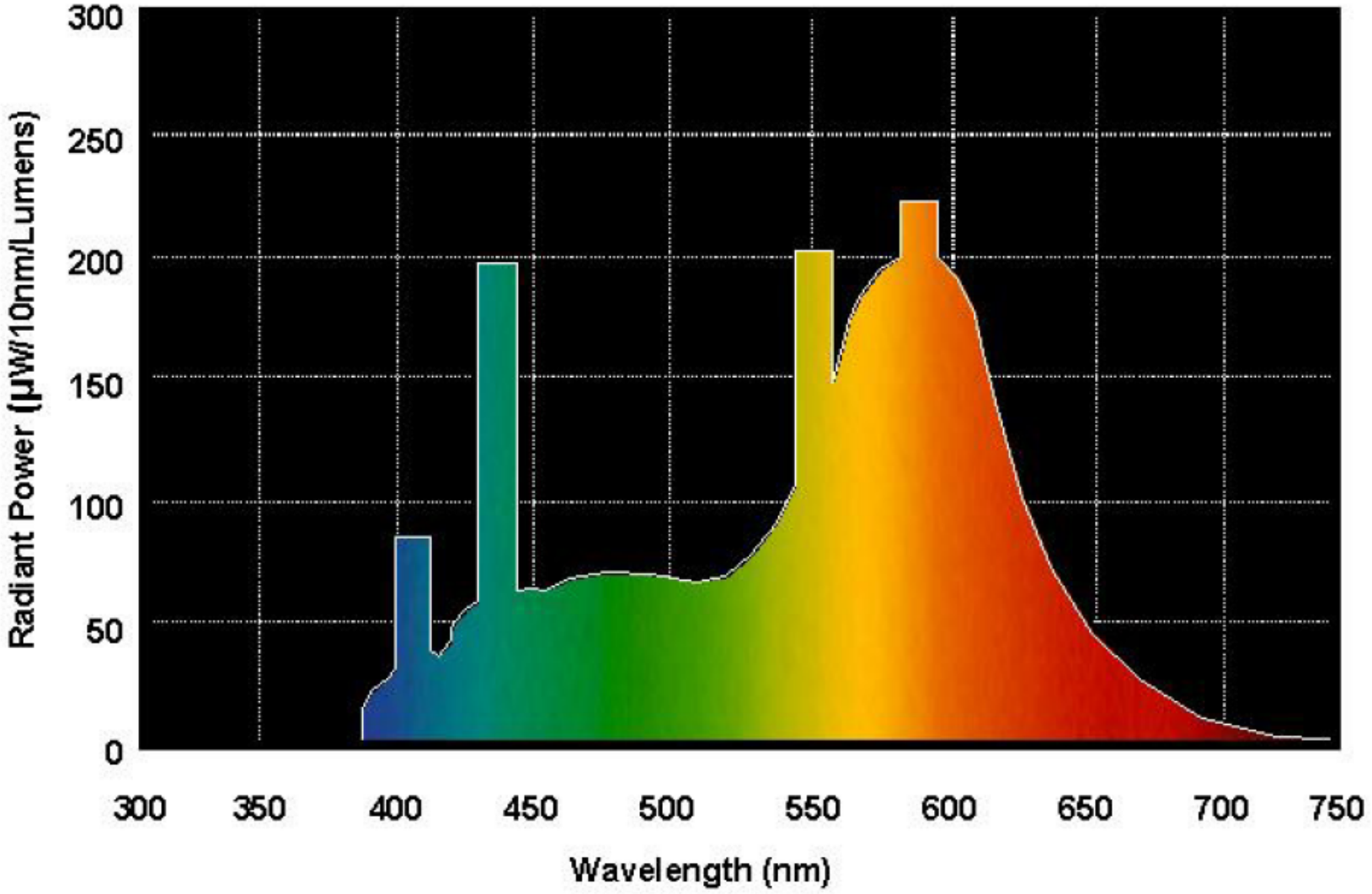



Electrode
Starter Switch
Phosphor Coating
Pins
Ballast
Mercury
AC SUPPLY
Argon Gas

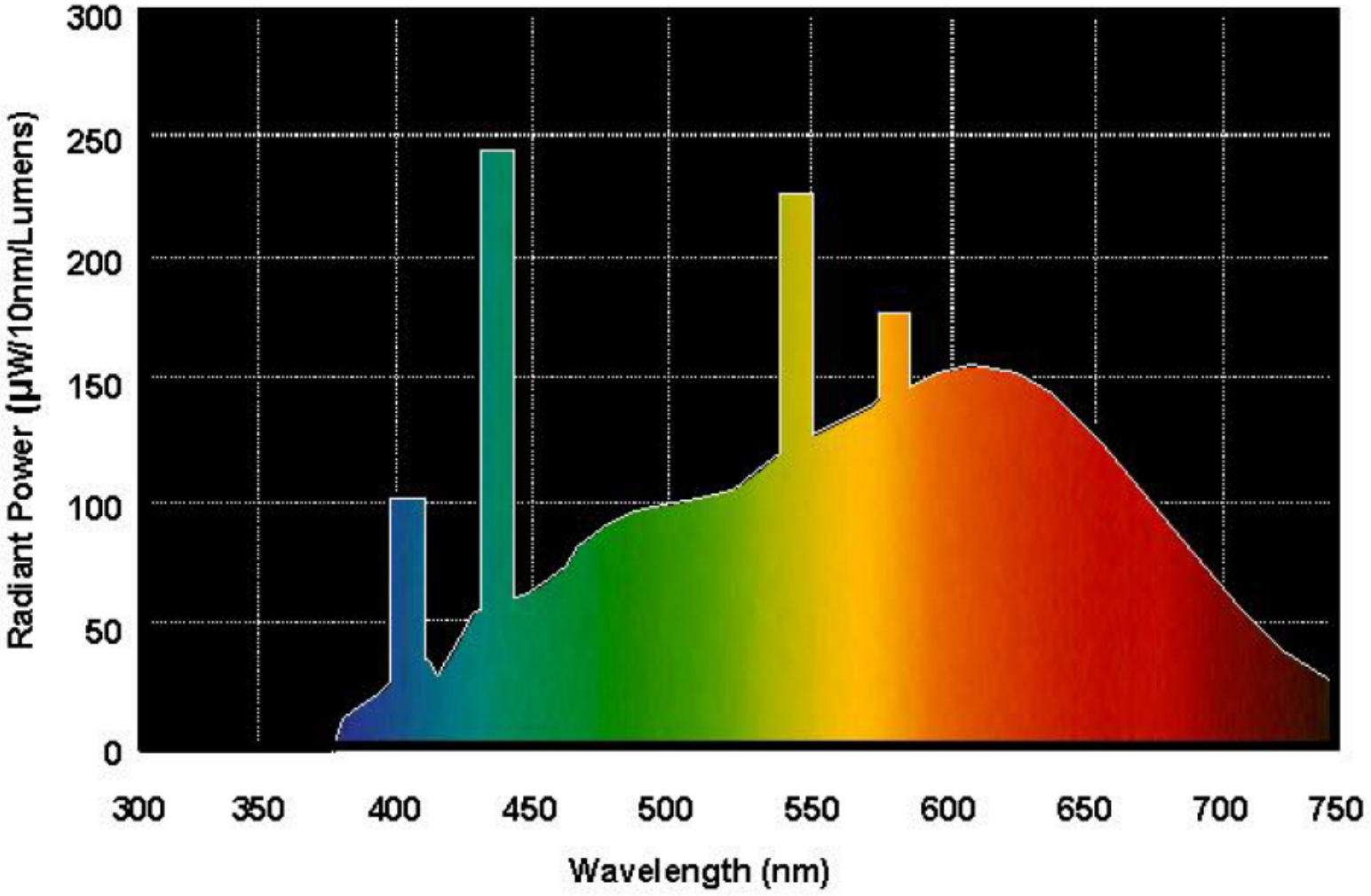

400
500
600
700 mm


400
500
600
700 mm

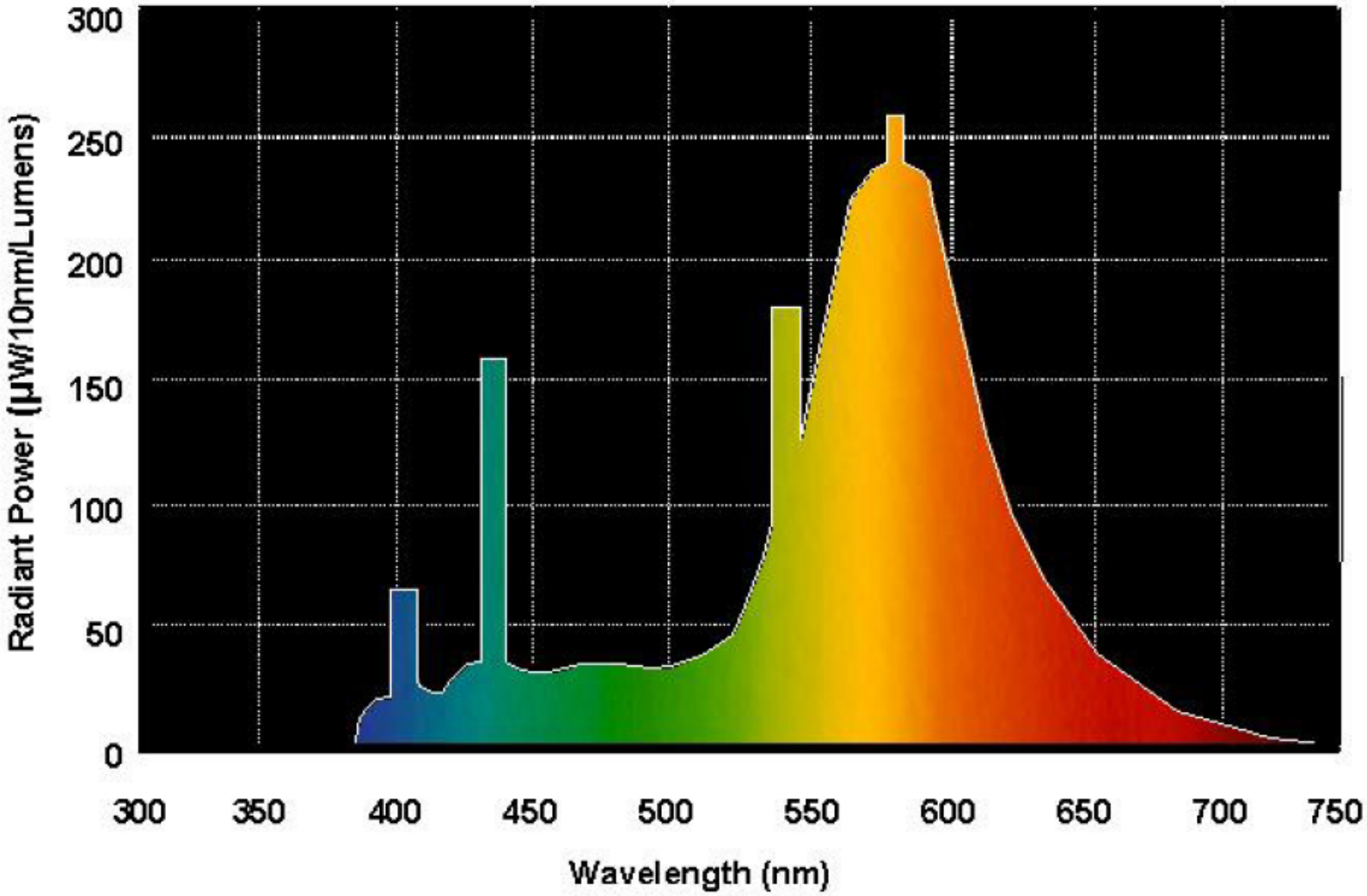
Zářivkové osvětlení - CWF



Zářivkové osvětlení – CWX (cool white deluxe)



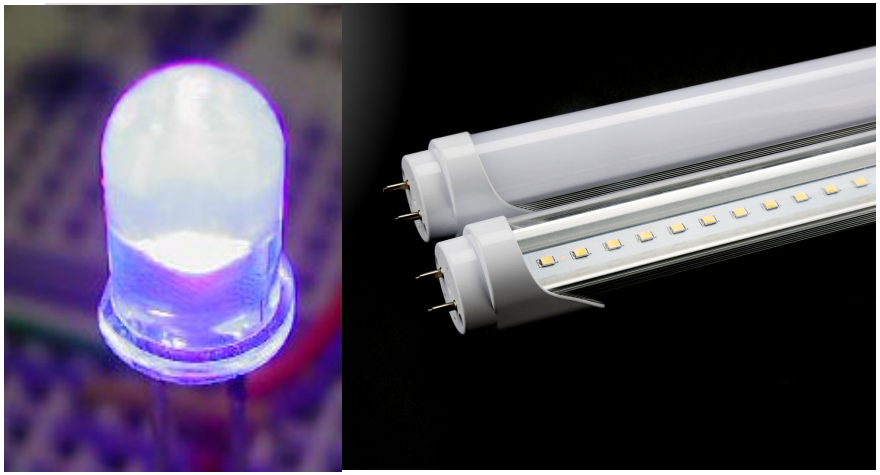
Zářivkové osvětlení – WWF (warm white)

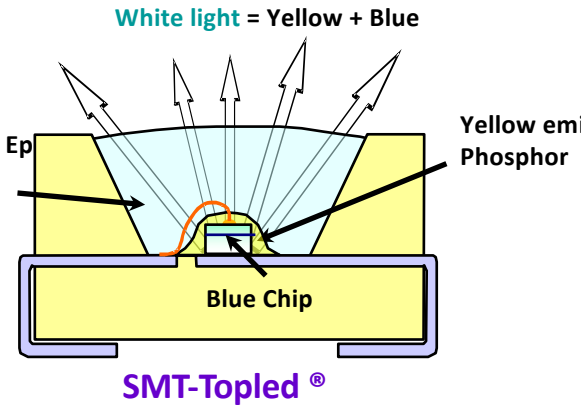


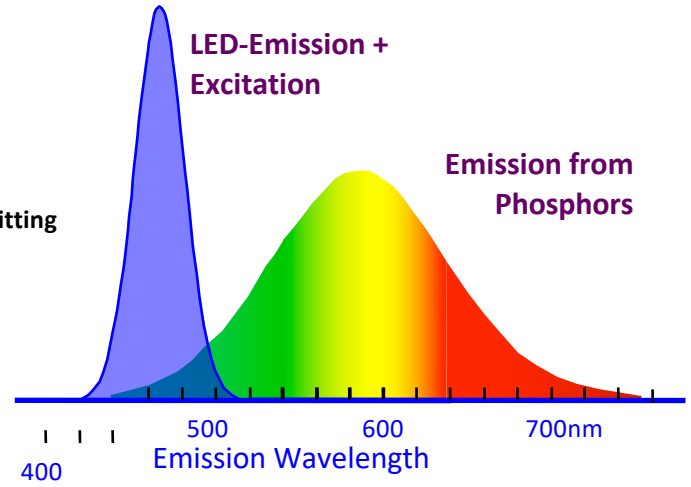
Light Emitting Diode - LED

vlastnosti LED:
spektrum optického záření s min. UV a IR
miniaturní rozměry
usměrněný světelný tok
možnost stmívání
vysoká životnost

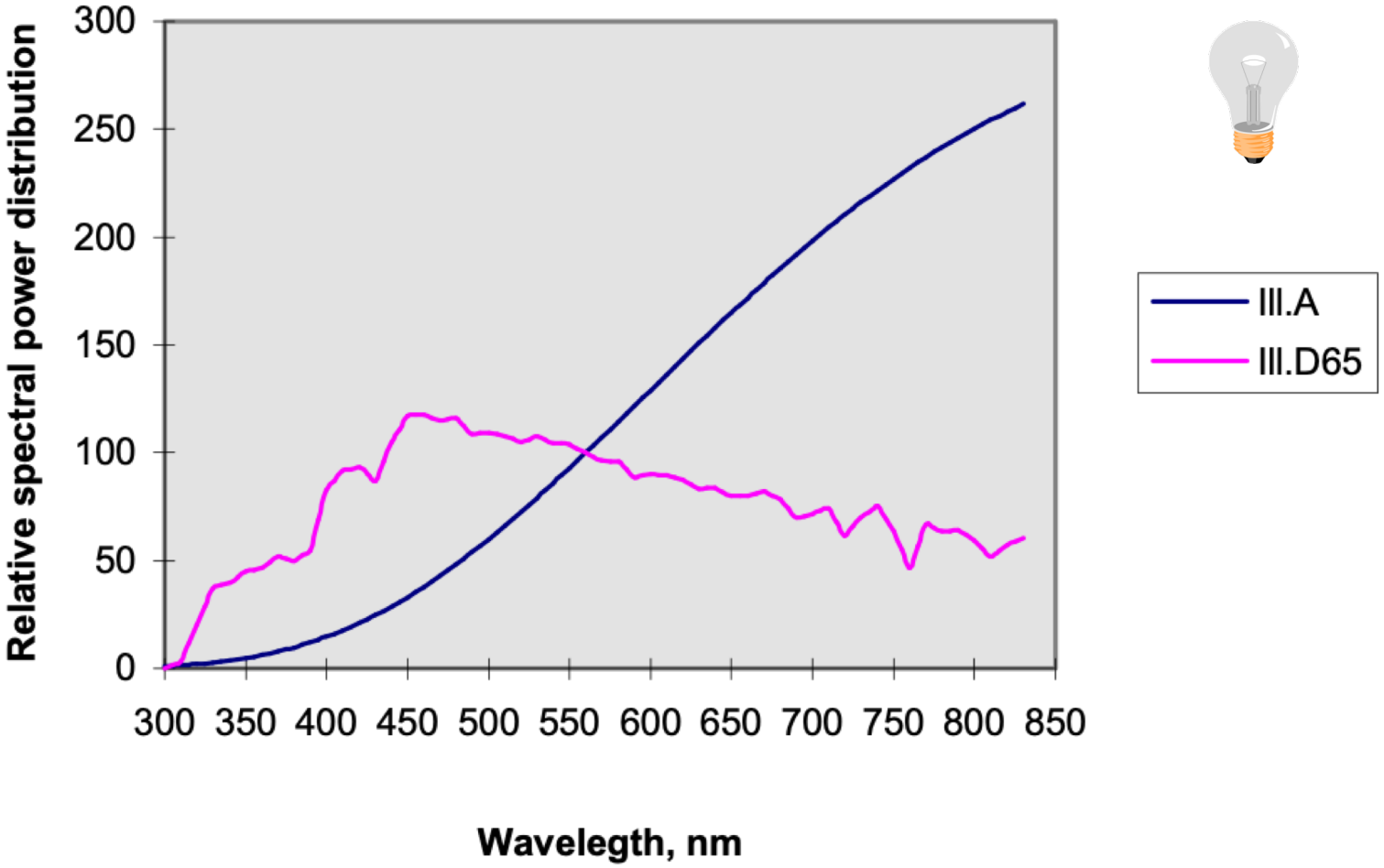
současné nedostatky
tepelné ztráty na stabil. členech
cena
teplotní závislost



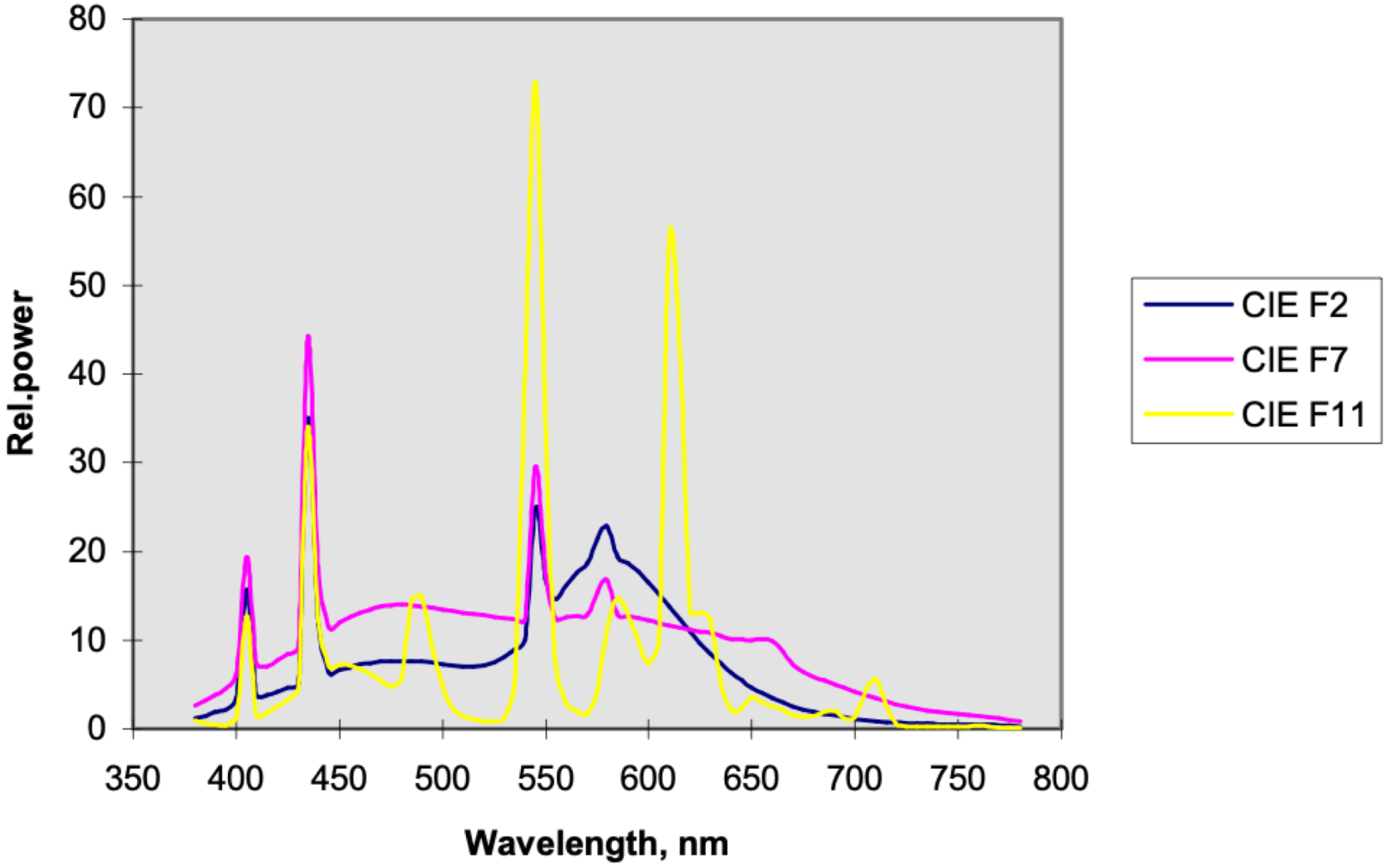




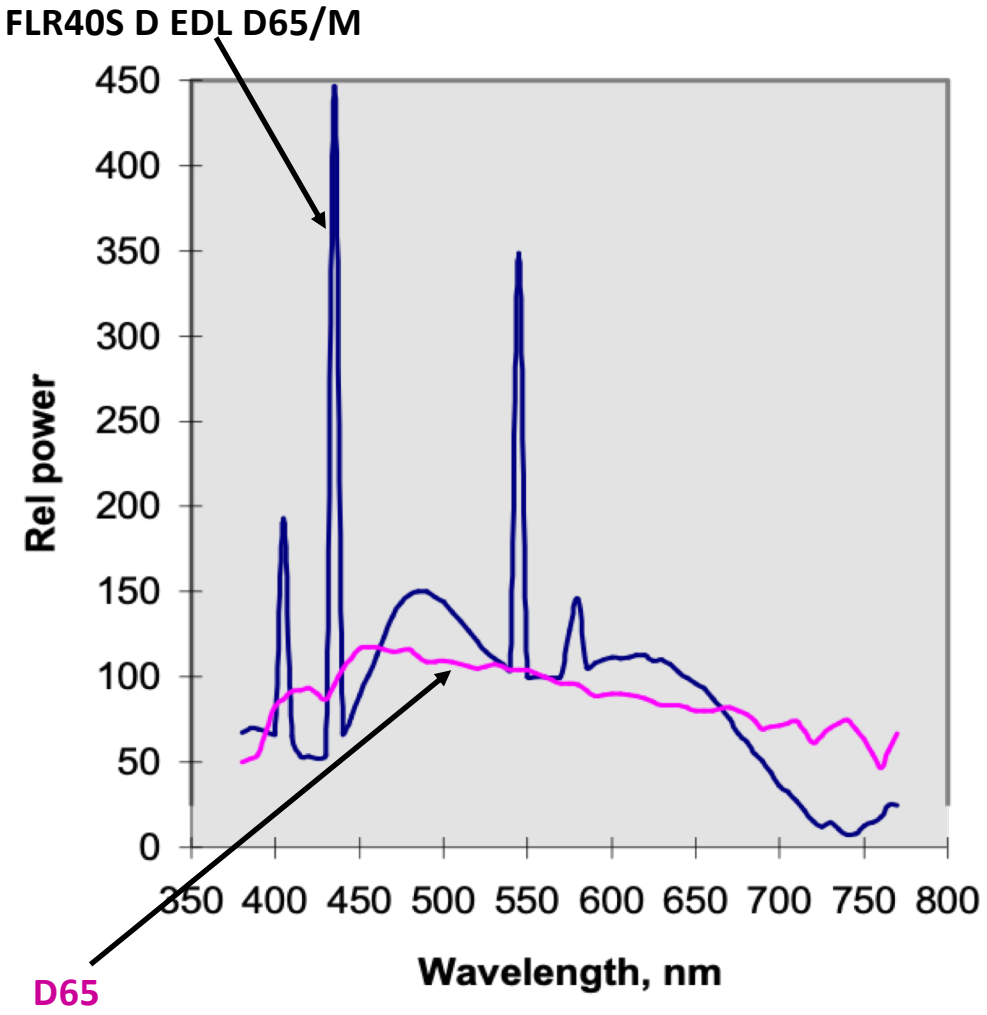
CIE standardní osvětlení I

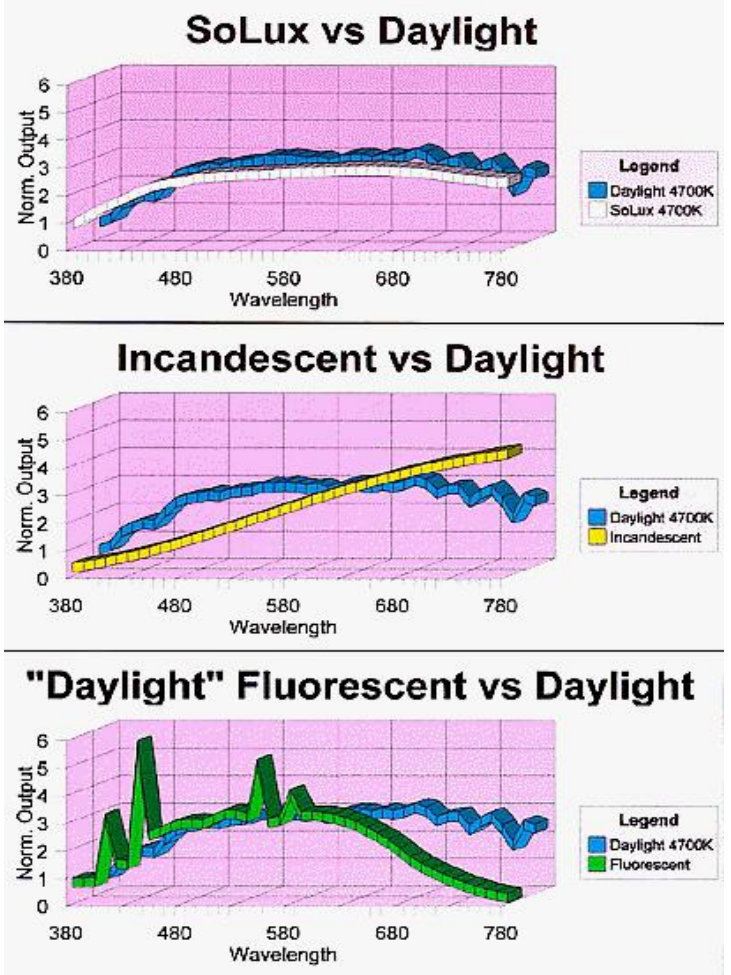


CIE standardní osvětlení II

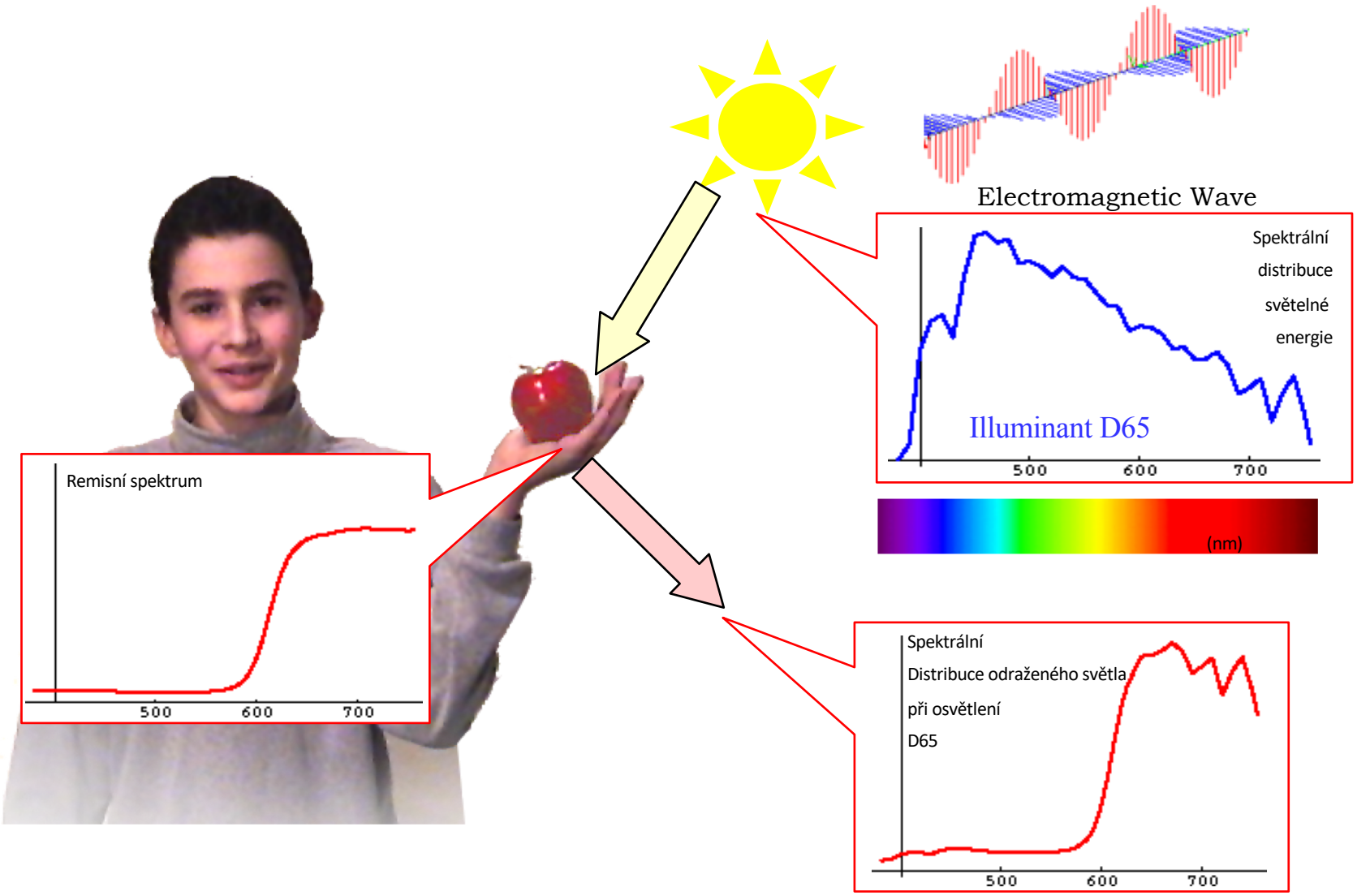


Simulátory denního světla

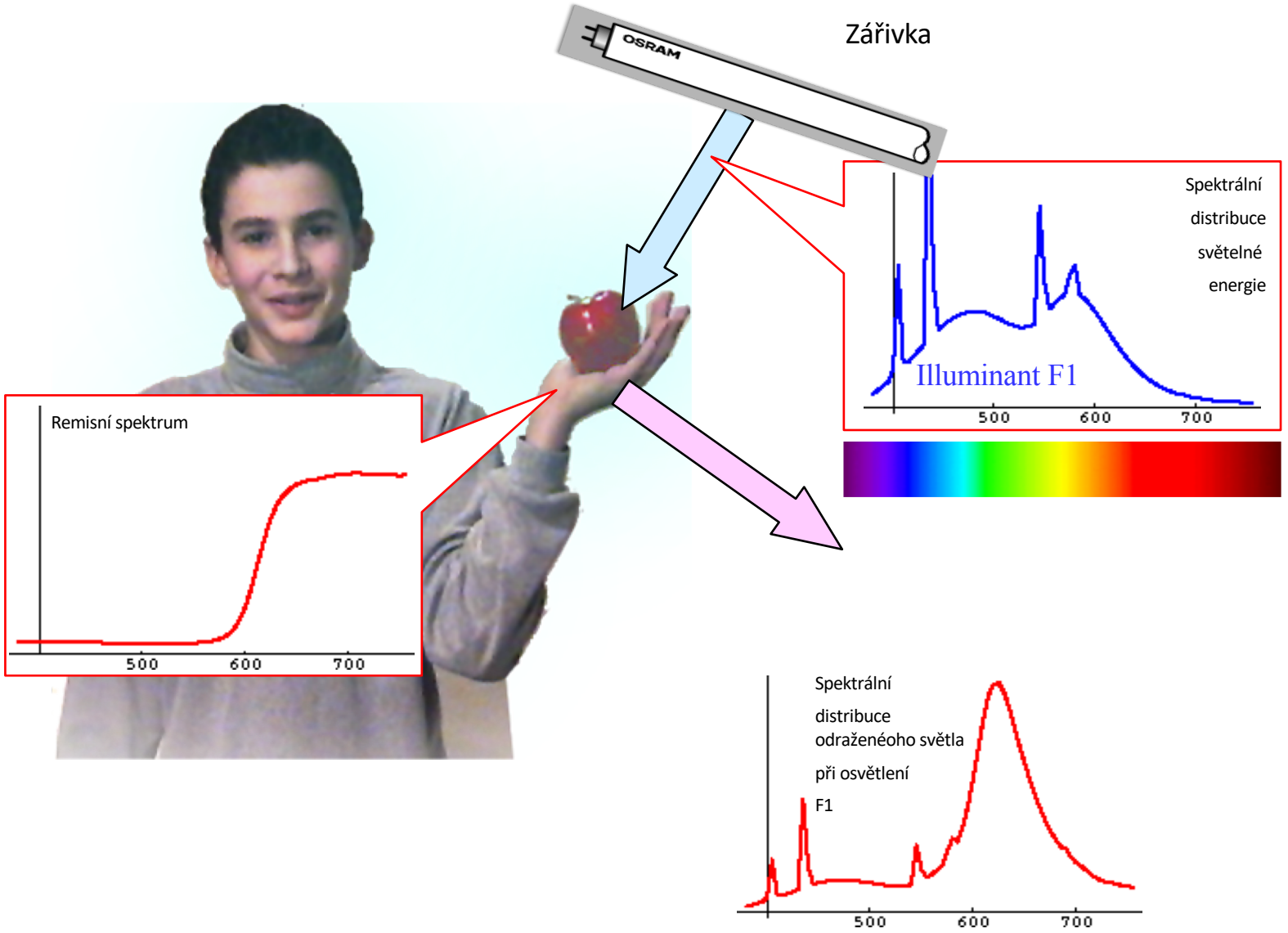




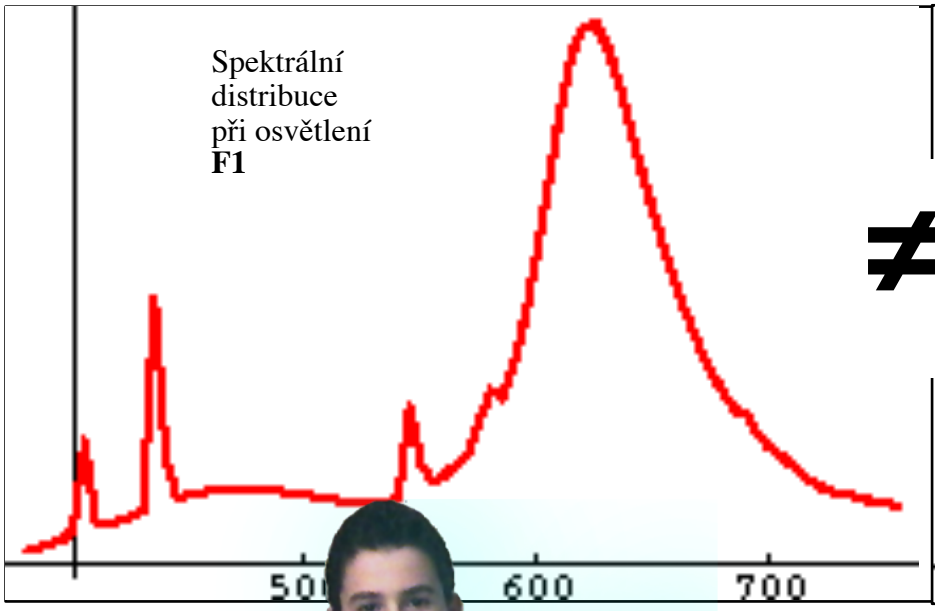
Stabilita odstínu (color constancy) I



Stabilita odstínu (color constancy) II



Stabilita odstínu (color constancy) III



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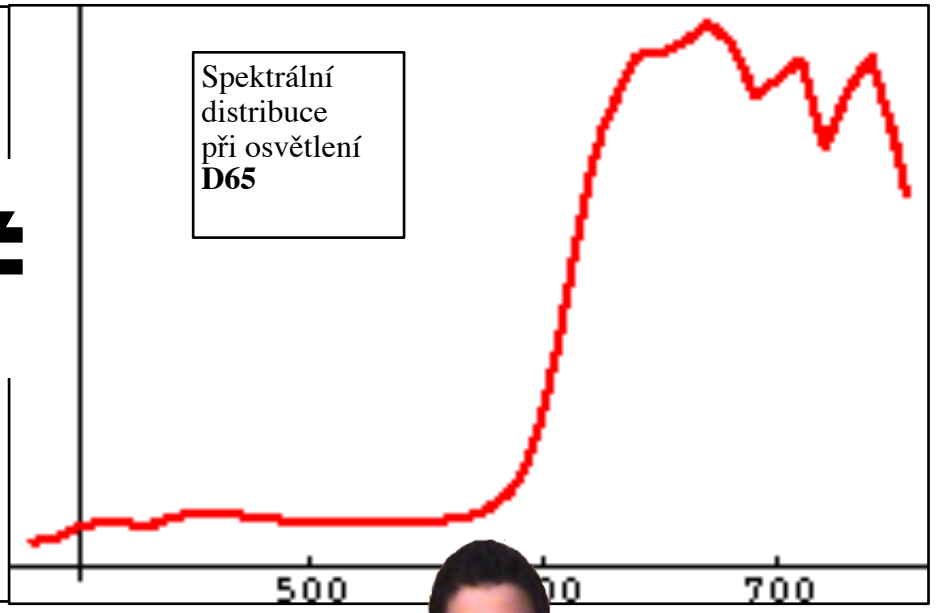
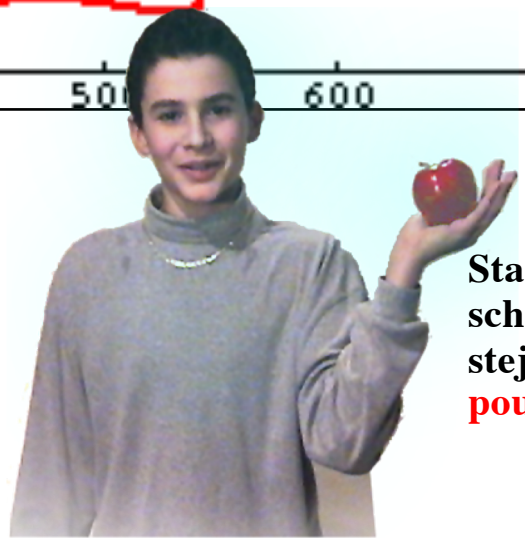
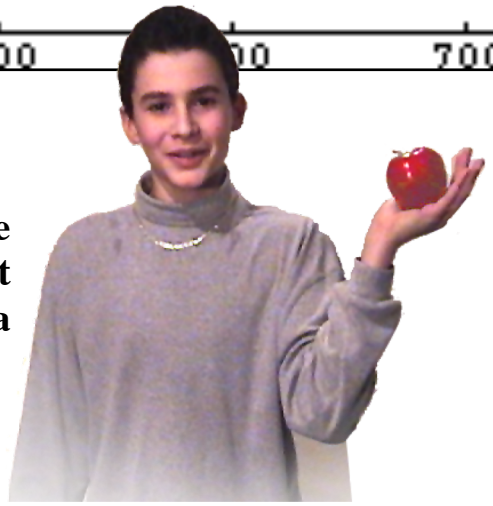
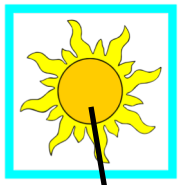




Stabilitou odstínu rozumíme schopnost odstínu vyvolávat stejný vjem barvy nezávisle na použitém osvětlení



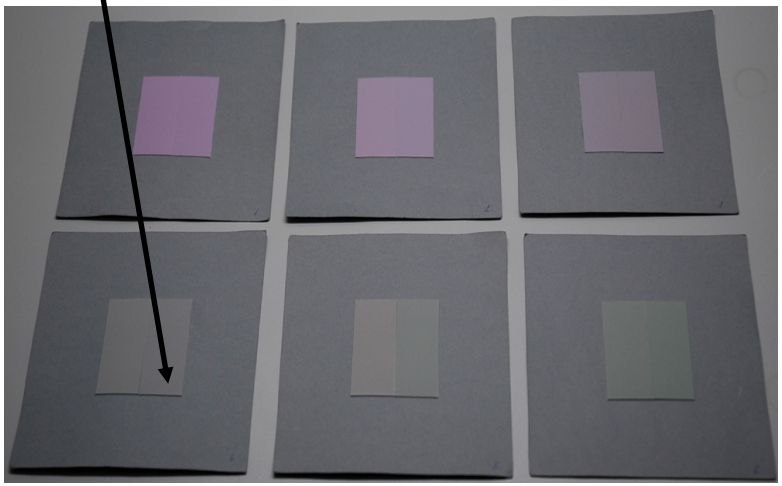
Hodnocení metamerie I

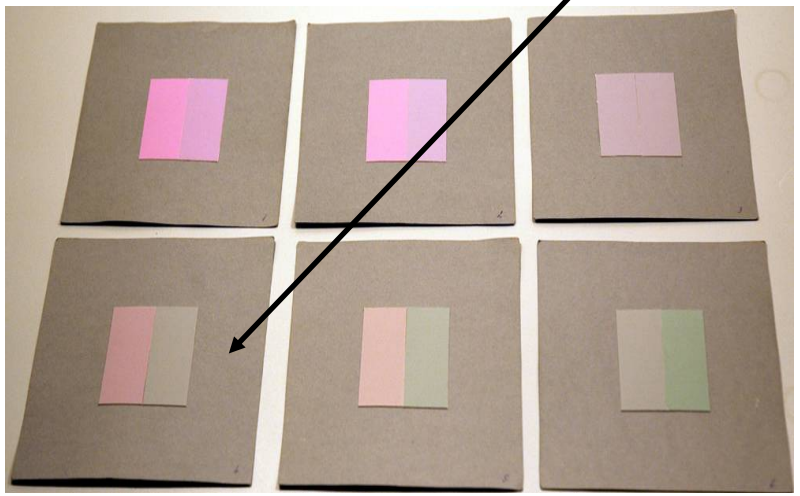


D65

Metamerie je jev, kdy dva vzorky pod jedním typem osvětlení (D65) se jeví jako shodné a pod druhým typem osvětlení (A) se jeví jako rozdílné

A

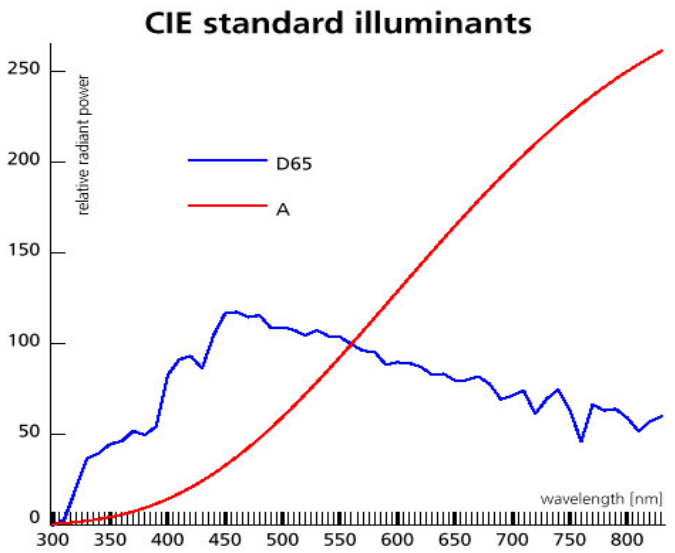


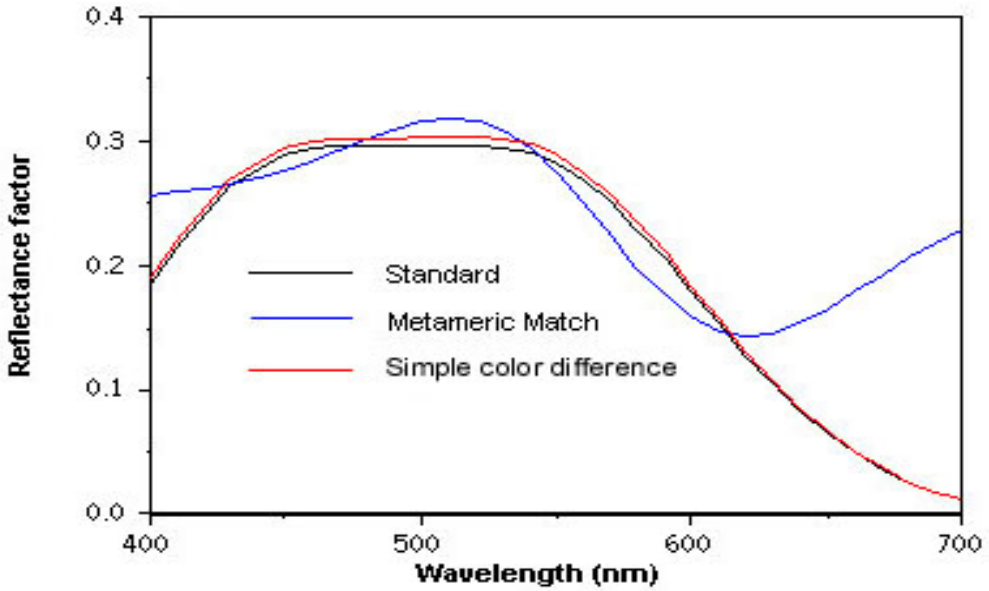


$$X_1^{D65} = X_2^{D65}$$
$$Y_1^{D65} = Y_2^{D65}$$
$$Z_1^{D65} = Z_2^{D65}$$

$$X_1^{(A,TL84,CWF..)} \neq X_2^{(A,TL84,CWF..)}$$
$$Y_1^{(A,TL84,CWF..)} \neq Y_2^{(A,TL84,CWF..)}$$
$$Z_1^{(A,TL84,CWF..)} \neq Z_2^{(A,TL84,CWF..)}$$

Hodnocení metamerie II





D65(Daylight) - Match

$$\int_{380}^{760} R_1(\lambda)E_\lambda \bar{x}(\lambda)d\lambda = \int_{380}^{760} R_2(\lambda)E_\lambda \bar{x}(\lambda)d\lambda$$

$$\int_{380}^{760} R_1(\lambda)E_\lambda \bar{y}(\lambda)d\lambda = \int_{380}^{760} R_2(\lambda)E_\lambda \bar{y}(\lambda)d\lambda$$

$$\int_{380}^{760} R_1(\lambda)E_\lambda \bar{z}(\lambda)d\lambda = \int_{380}^{760} R_2(\lambda)E_\lambda \bar{z}(\lambda)d\lambda$$

A(Tungstenlight) - Missmatch

$$\int_{380}^{760} R_1(\lambda)E_\lambda \bar{x}(\lambda)d\lambda \neq \int_{380}^{760} R_2(\lambda)E_\lambda \bar{x}(\lambda)d\lambda$$

$$\int_{380}^{760} R_1(\lambda)E_\lambda \bar{y}(\lambda)d\lambda \neq \int_{380}^{760} R_2(\lambda)E_\lambda \bar{y}(\lambda)d\lambda$$

$$\int_{380}^{760} R_1(\lambda)E_\lambda \bar{z}(\lambda)d\lambda \neq \int_{380}^{760} R_2(\lambda)E_\lambda \bar{z}(\lambda)d\lambda$$

Hodnocení metamerie III

Metamerní barevné rozdíly :

v kolorimetrické soustavě CIELCH pro D65 a A:

$$\Delta ME^*_{D65-A} = \left[\left(\Delta L^*_{D65} - \Delta L^*_A \right)^2 + \left(\Delta C^*_{D65} - \Delta C^*_A \right)^2 + \left(\Delta H^*_{D65} - \Delta H^*_A \right)^2 \right]^{1/2}$$

v kolorimetrické soustavě CIELCH pro D65 a F11:

$$\Delta ME^*_{D65-F11} = \left[\left(\Delta L^*_{D65} - \Delta L^*_{F11} \right)^2 + \left(\Delta C^*_{D65} - \Delta C^*_{F11} \right)^2 + \left(\Delta H^*_{D65} - \Delta H^*_{F11} \right)^2 \right]^{1/2}$$