

# Radiation damage recovery of PWO-II crystals under light illumination. New results.

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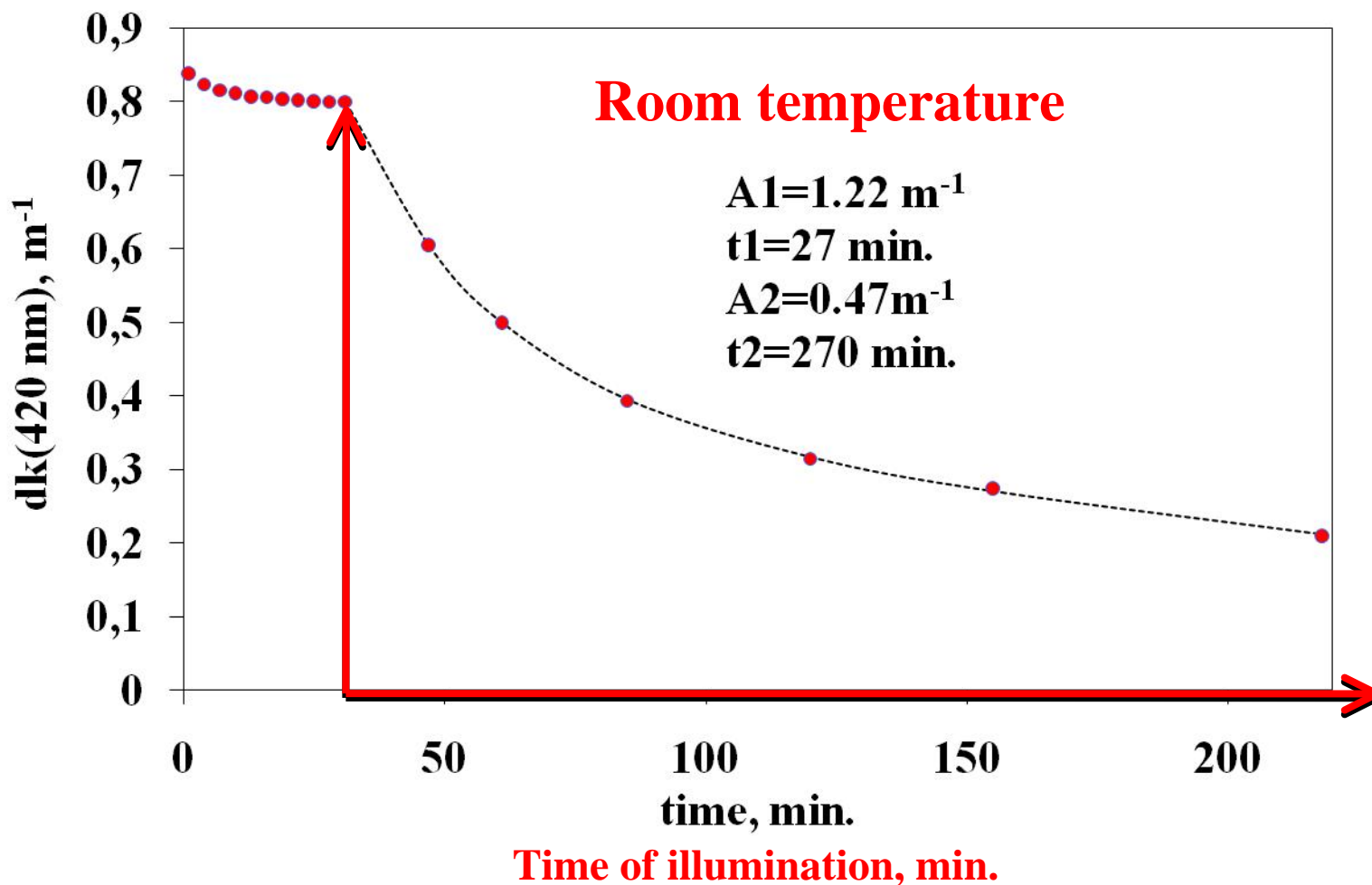
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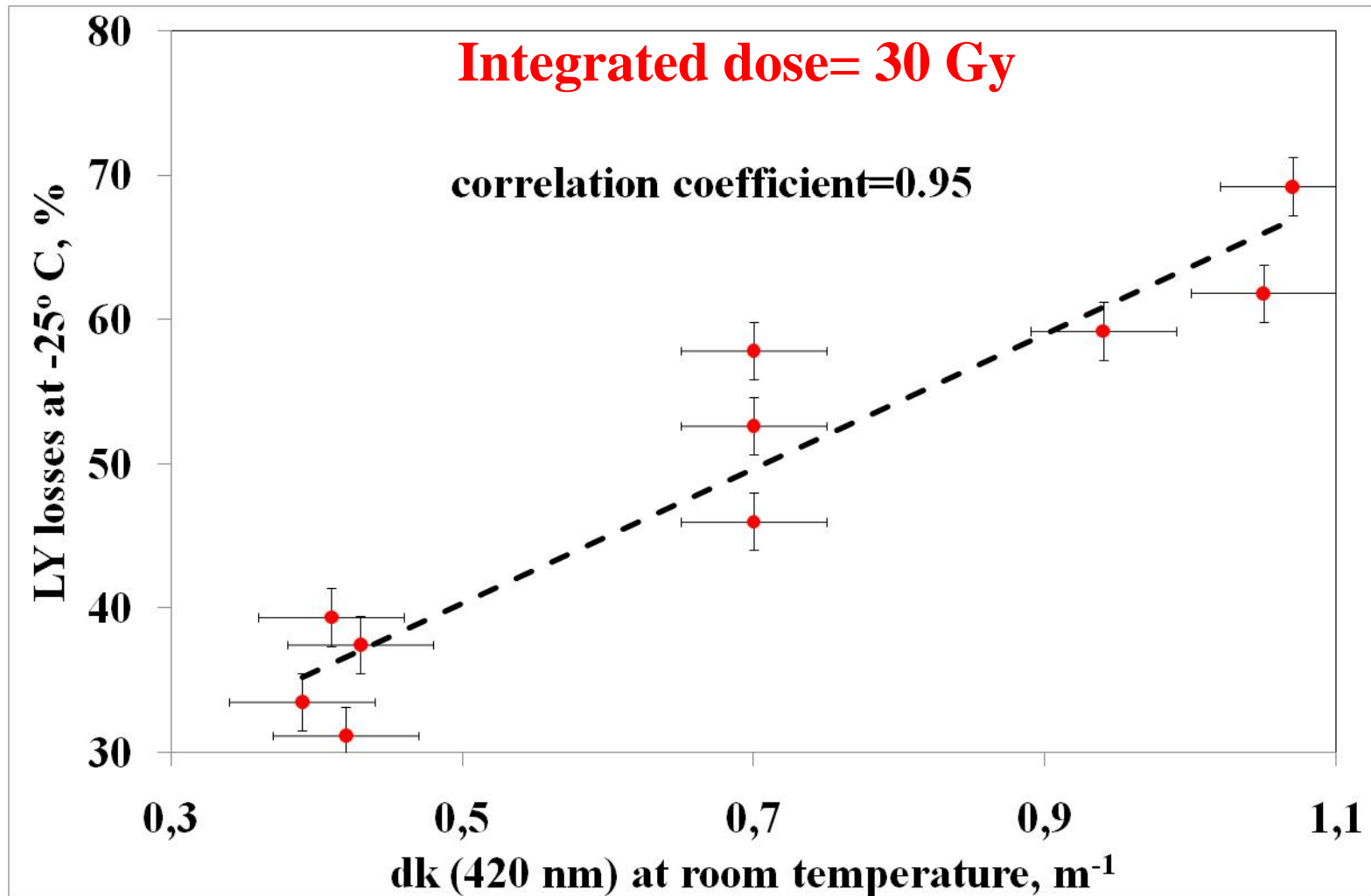
# Questions:

- 1) Experimental data for Model of the radiation damage recovery in PWO-II crystal under light illumination.**
- 2) Define minimum energy (maximum wavelength) of light photons, when the recovery process is possible**

# Recovery of PWO radiation absorption at 420 nm under infrared LED ( $\lambda_{\max}=940\text{ nm}$ ) light

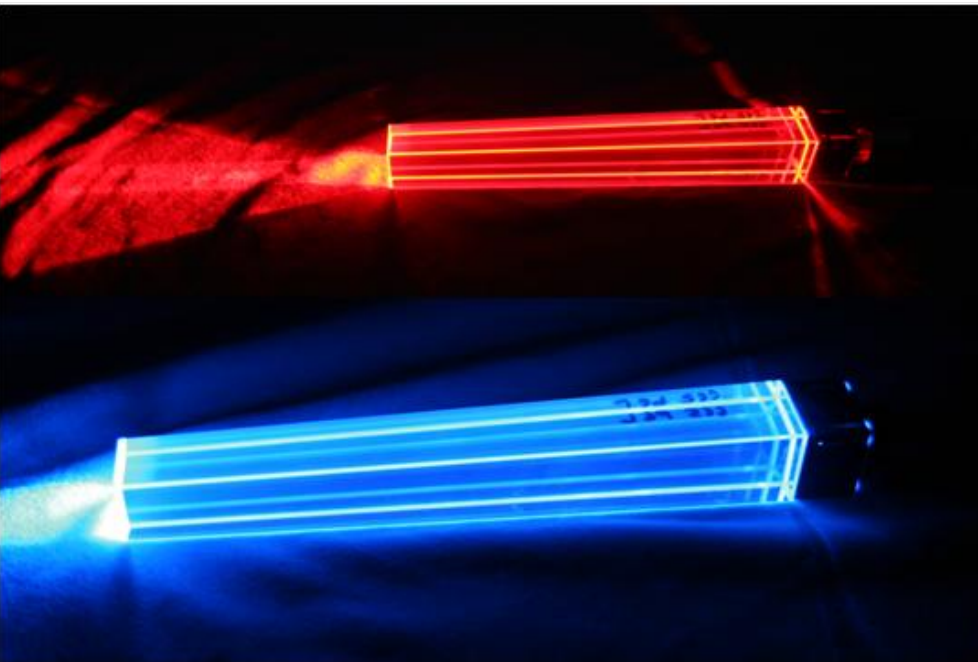


# Correlation Light Yield losses vs dk@420 nm after $\gamma$ -quanta irradiation



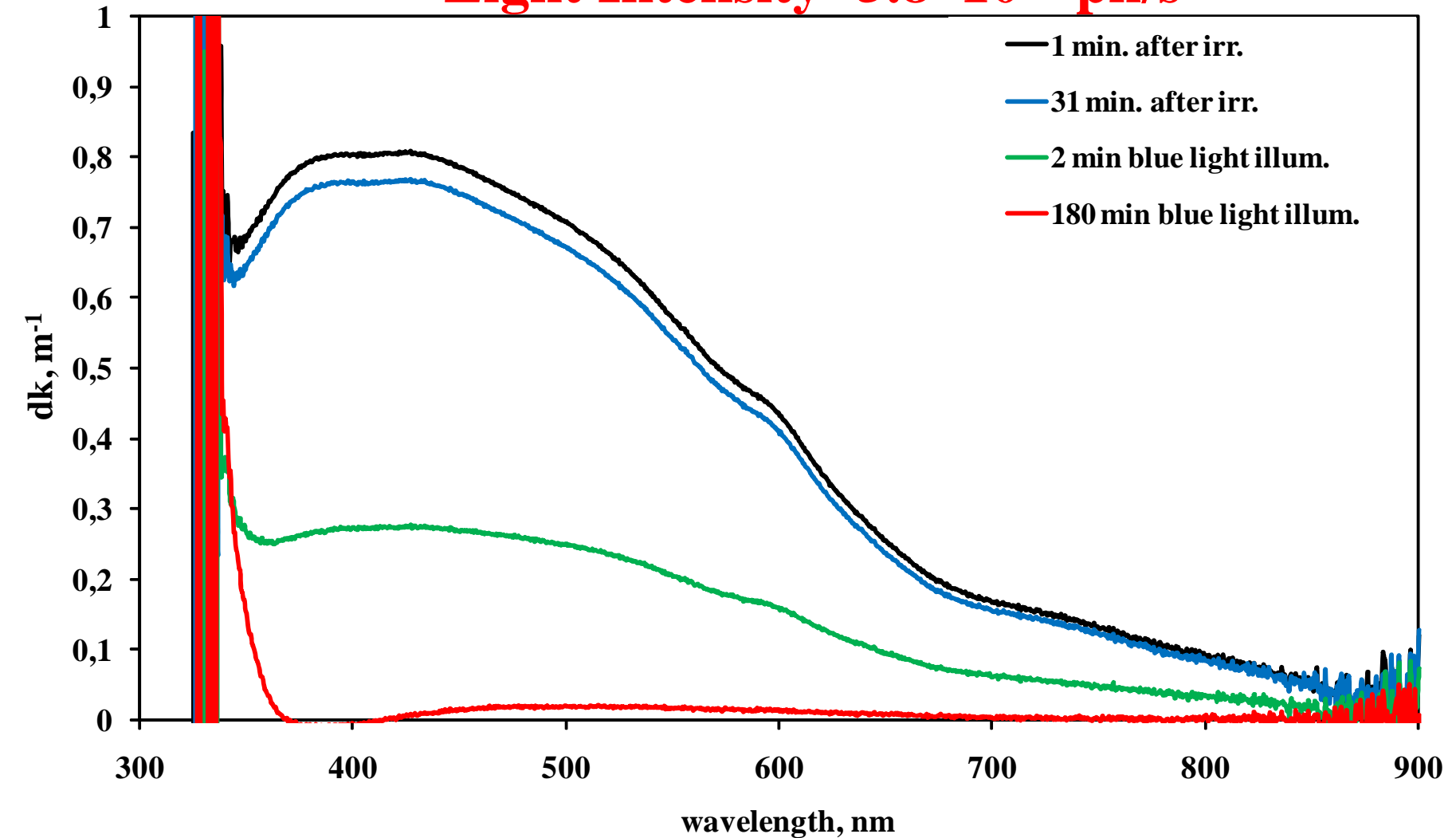
# Experimental conditions

- measurements at room temperature
- irradiation with  $^{60}\text{Co}$ , Dose=30 Gy, Dose rate=3.4 Gy/min. Crystal was annealed before every test
- sample: EndCap type PWO-II crystal (#2630, Lot B6)
- reflector in time of illumination: 3 layers of TYVEK paper
- damage and recovery characterized by radiation induced coefficient  $dk$   
$$dk = [\text{Ln}(T_{\text{before}}/T_{\text{after}})]/d, [\text{m}^{-1}]$$
- illumination with LEDs of different color

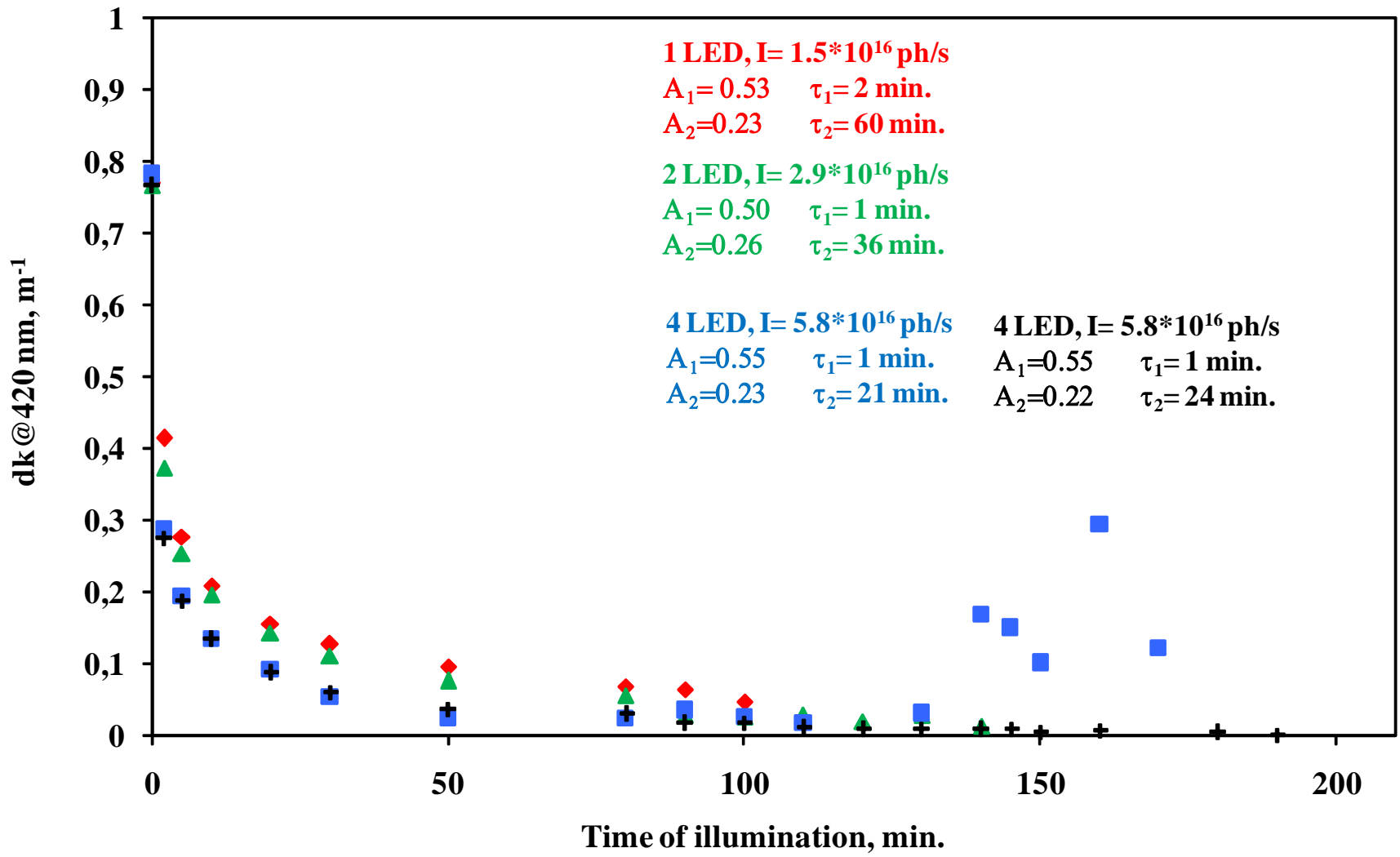


# Recovery of PWO radiation absorption under illumination with blue light (464 nm). dk spectra.

Light Intensity =  $5.8 \cdot 10^{16}$  ph/s

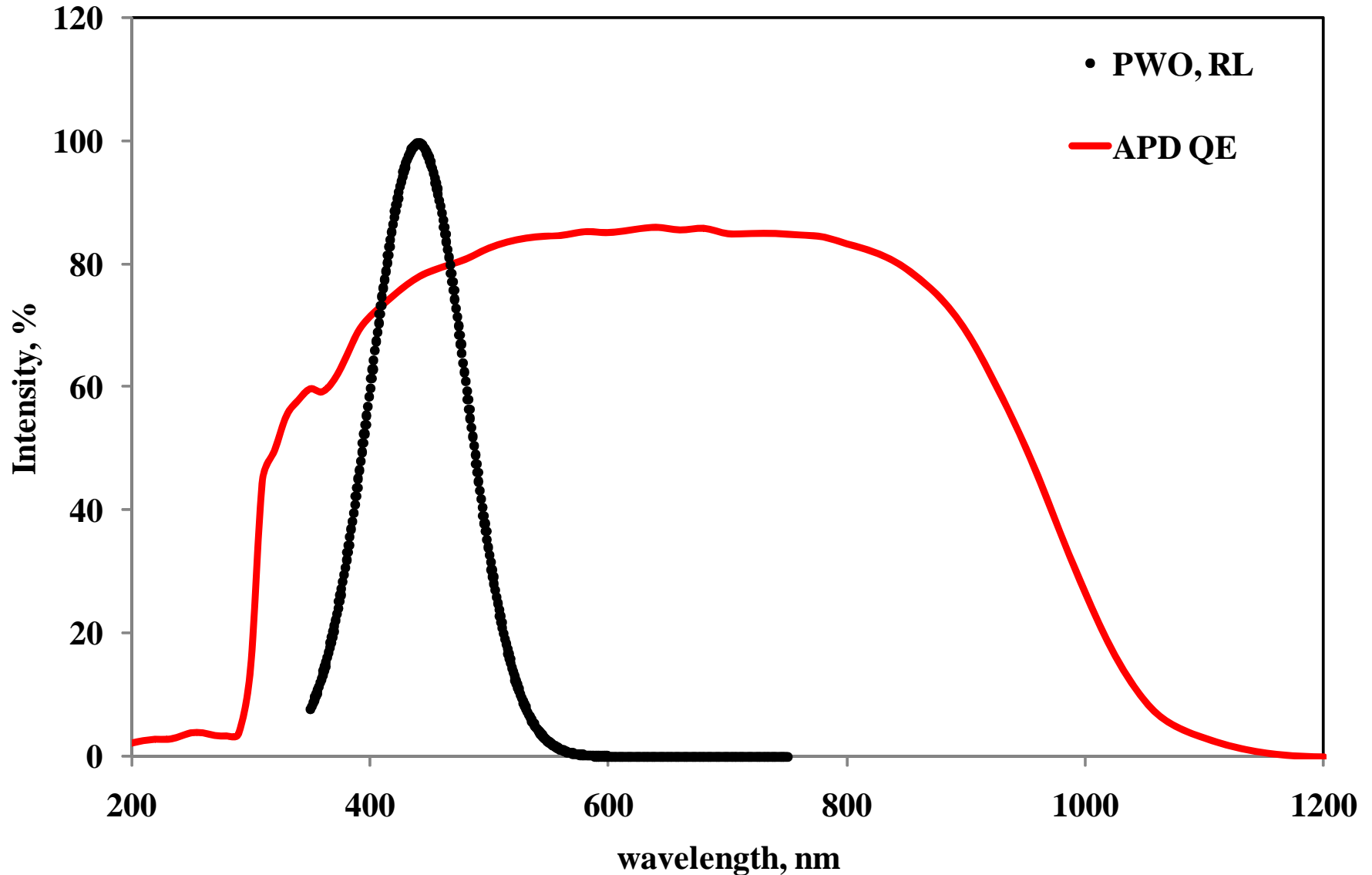


# Recovery of PWO radiation absorption under illumination with blue light (464 nm). dk@420 nm time spectrum.



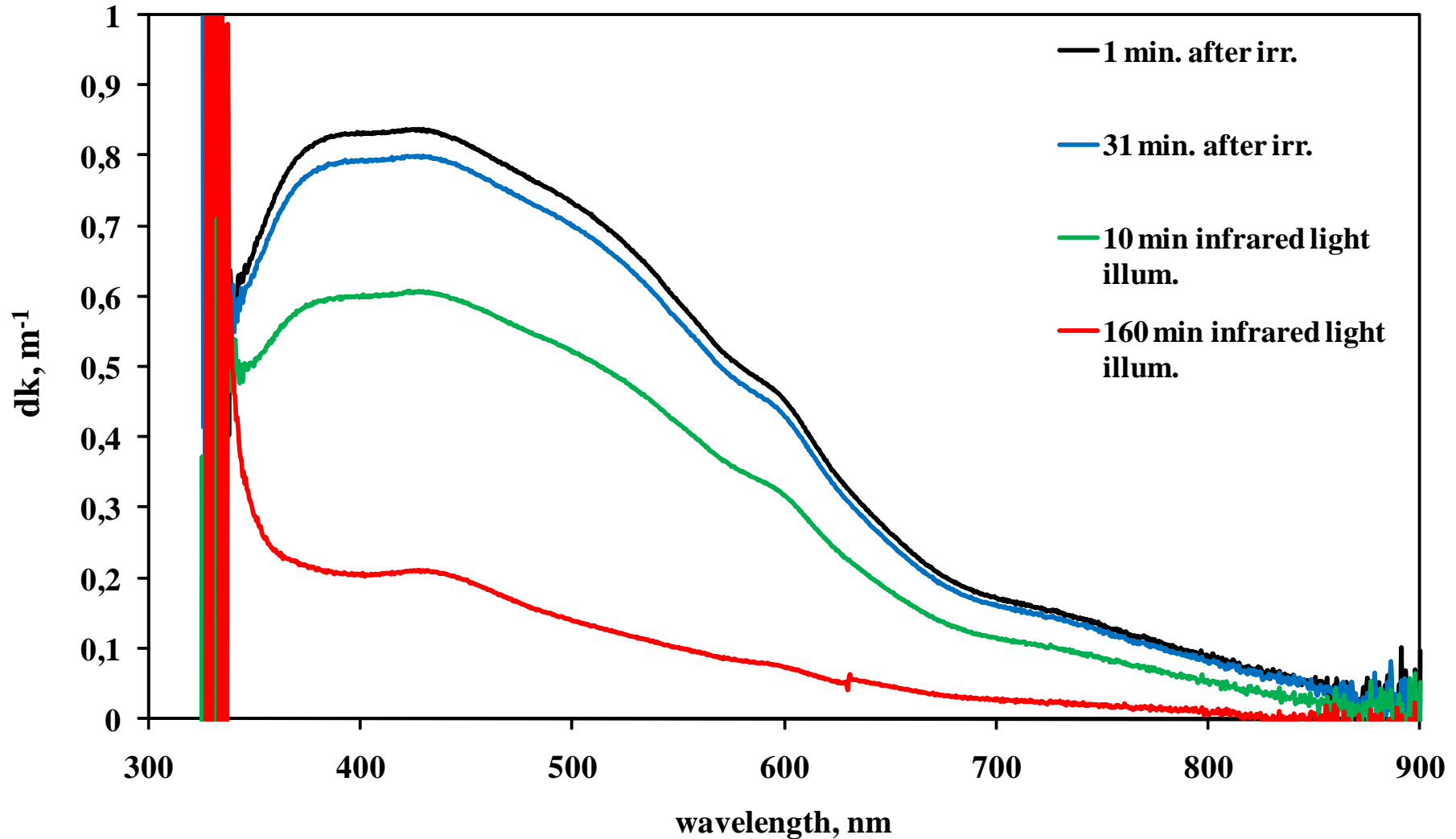


# Spectra of PWO-II Luminescence and Quantum Efficiency of APD

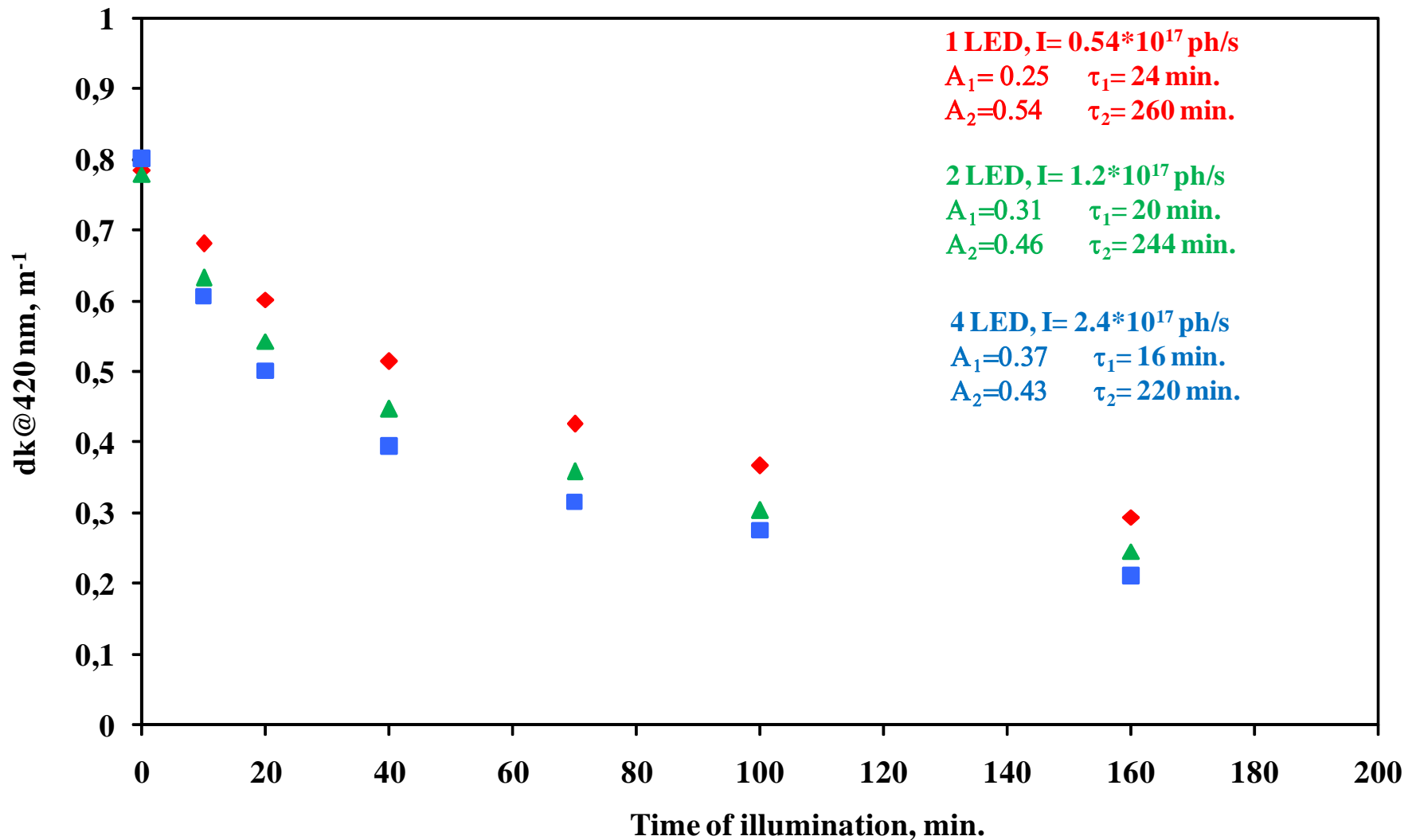


# Recovery of PWO radiation absorption under illumination with **infrared light (940 nm)**. dk spectra.

**Light Intensity =  $2.4 \cdot 10^{17}$  ph/s**

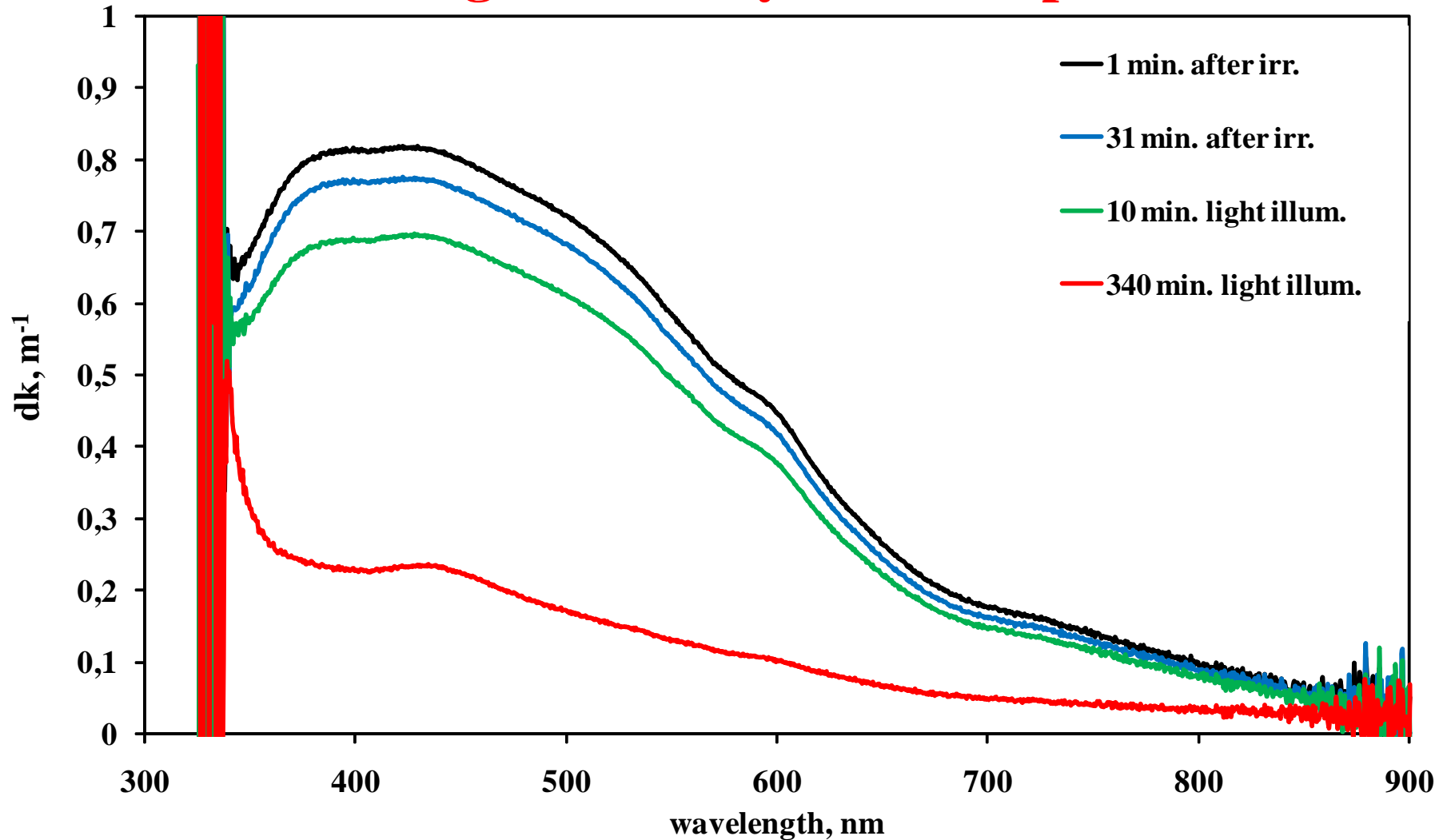


# Recovery of PWO radiation absorption under illumination with **infrared light (940 nm)**. dk@420 nm time spectrum.

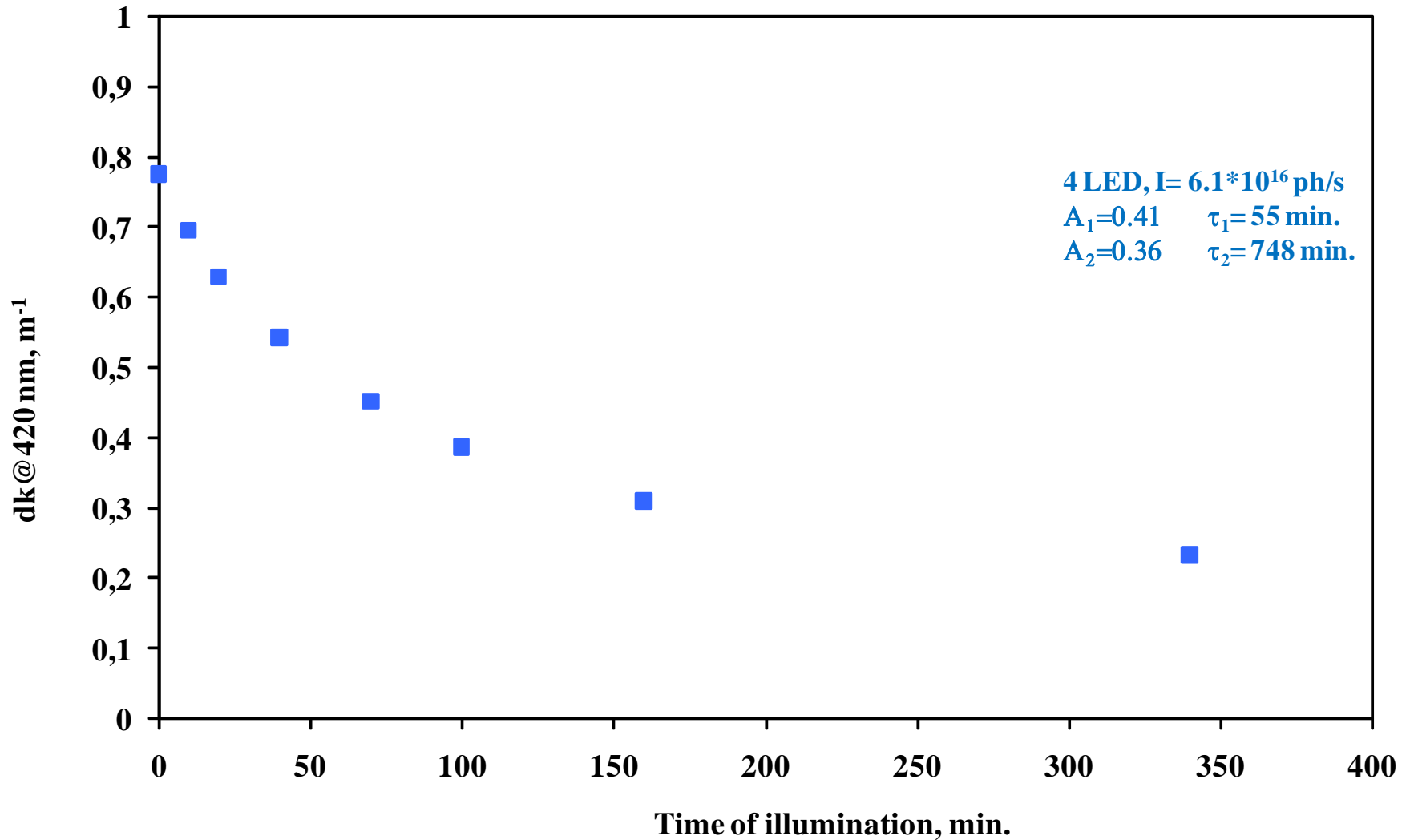


# Recovery of PWO radiation absorption under illumination with **infrared light (1060 nm)**. dk spectrum.

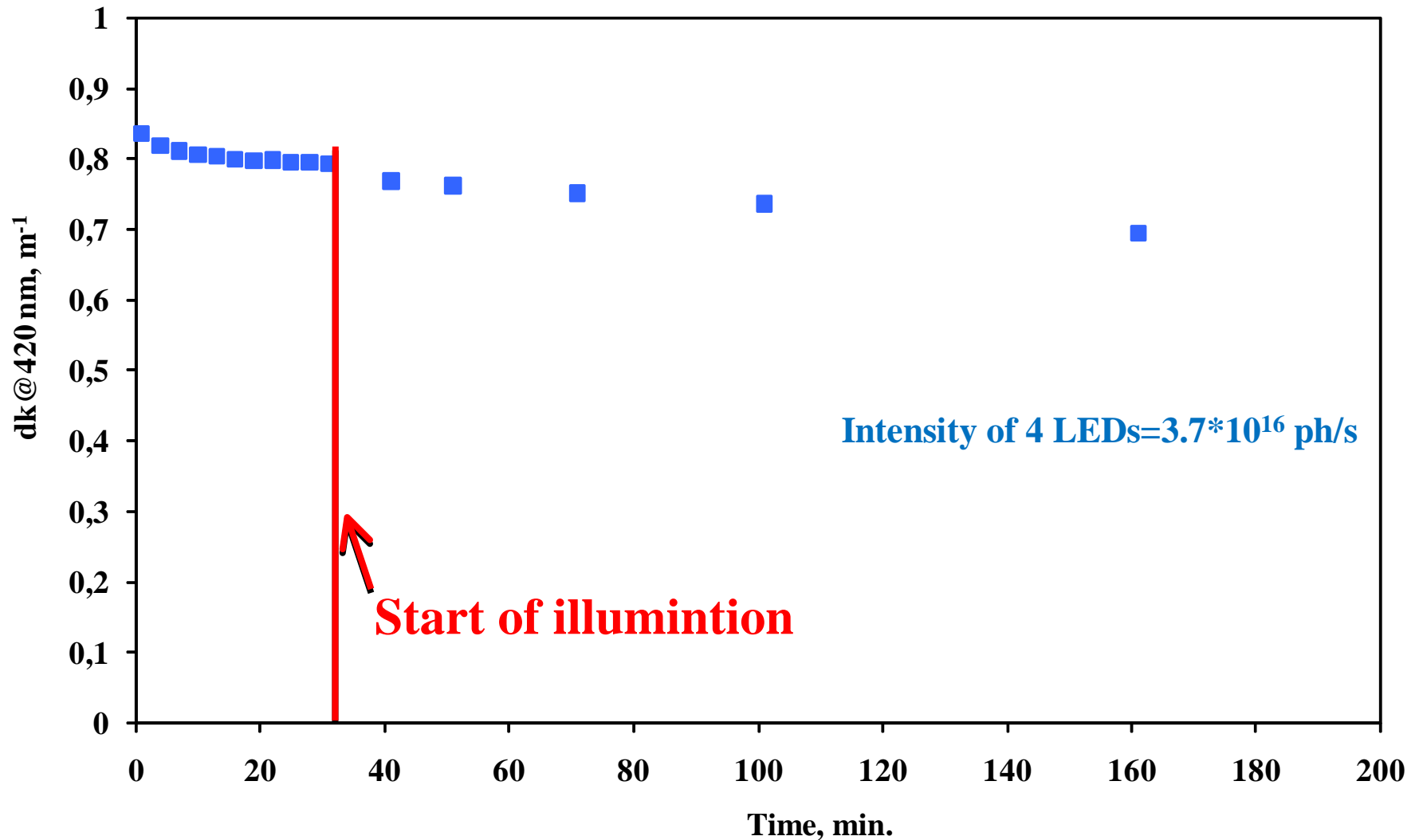
**Light Intensity =  $6.1 \cdot 10^{16}$  ph/s**



# Recovery of PWO radiation absorption under illumination with **infrared light (1060 nm)**. dk@420 nm time spectrum.



# Recovery of PWO radiation absorption under illumination with **infrared light (1300 nm)**. dk@420 nm time spectrum.



# Conclusions

- **Intensity of the recovery under light illumination is increased with energy of photons**
- **Recovery in full visible spectrum is observed, even with infrared ( $\lambda_{\text{max}} = 1060 \text{ nm}$ ) light illumination**
- **Recovery under light illumination with wavelength above 1100 nm have to investigated**

# Future plans

**1) Design concept of PANDA EMC based on the stimulated recovery process is possible?**

**2) Offline or online stimulated recovery?**

**Define maximum wavelength and optimal intensity of light photons, when the recovery process is possible at low temperature**