

MICRO-523: Optical Detectors

Week Four: Photoemissive Detectors - Exercises

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The logo of the École polytechnique fédérale de Lausanne (EPFL), consisting of the letters 'EPFL' in a bold, red, sans-serif font.

Exercise 4.1: The Detection Limit of a PMT

Consider a PMT with the following characteristics:

- Photocathode surface area: 2 cm^2
- Bandwidth: 100 Hz
- Temperature: 300K
- Work function: 1.25 eV
- Quantum Efficiency: 10% at 550nm
- Same sensitivity as the human eye.

- A) What is the NEP if the PMT is limited by the shot noise from the dark current?
(consider the excess noise factor to be equal to 1)
- B) At what distance L does a candle have to be placed in complete darkness to match this NEP ?