Problem 3

.During the Soviet-French experiment on the optical location of the Moon the light pulse of a ruby laser (λ= 0,69 μm) was directed to the Moon's surface by the telescope with a diameter of the mirror D = 2,6 m. The reflector on the Moon's surface reflected the light backward as an ideal mirror with the diameter d = 20 cm. The reflected light was then collected by the same telescope and focused at the photodetector.

1) What must the accuracy to direct the telescope optical axis be in this experiment?

2) What part of emitted laser energy can be detected after reflection on the Moon, if we neglect the light loses in the Earth's atmosphere?

3) Can we see a reflected light pulse with naked eye if the energy of single laser pulse E = 1 J and the threshold sensitivity of eye is equal n =100 light quantum?

4) Suppose the Moon's surface reflects α = 10% of the incident light in the spatial angle 2π steradian, estimate the advantage of a using reflector.

The distance from the Earth to the Moon is L = 380000 km. The diameter of pupil of the eye is d_p = 5mm. Plank constant is h = $6.6 \cdot 10^{-34}$ Js.