MICRO-428: Metrology

Week 14: quantum Metrology

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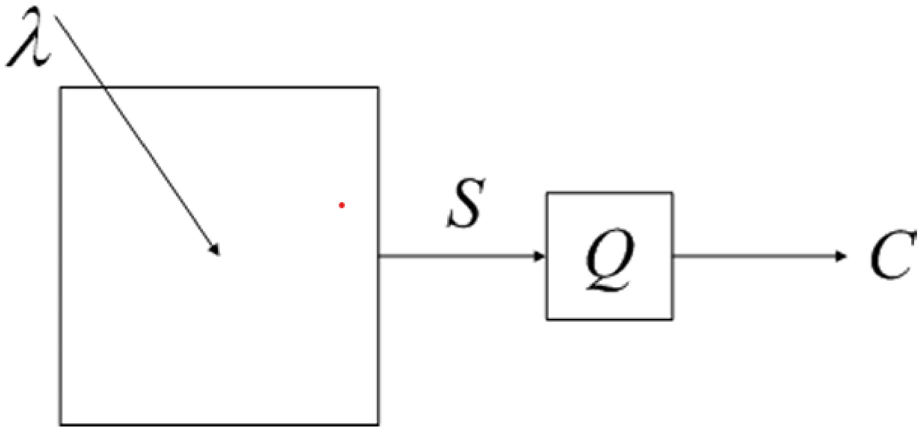
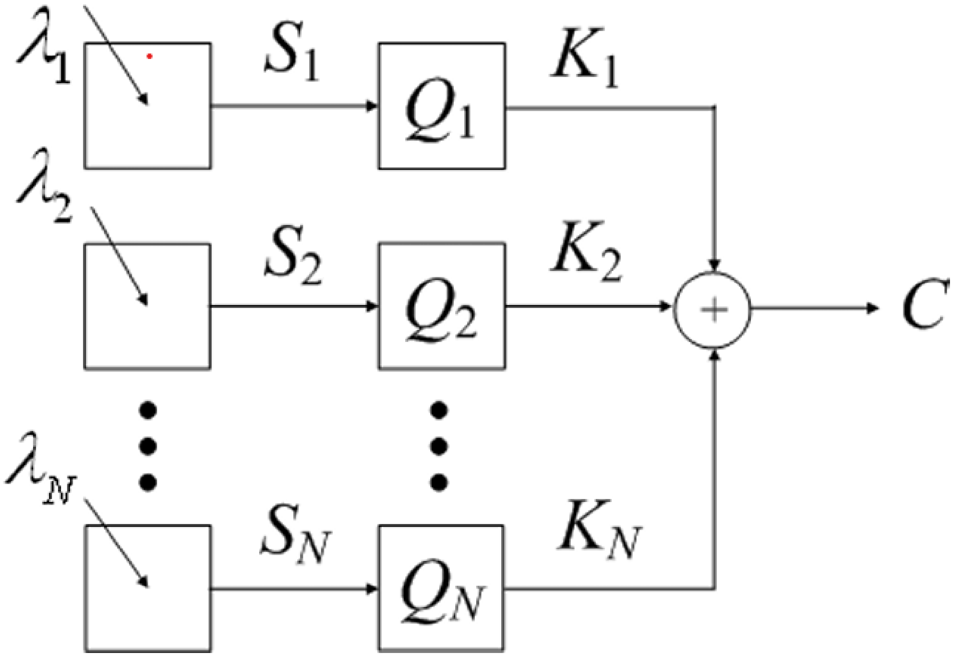
Exercise 1: Gigavision camera

Conventional Pixels:



Gigavision Pixels:



Exercise 1: Gigavision camera

The arrival of photons is well represented by Poisson distribution.

1) Given a threshold of detection T find the probability of detection: $p_\lambda = P\left[S_i \geq T\right]$

2) Knowing the expected count (E[C]) derive the incoming flux.

Exercise 1: Gigavision camera

The arrival of photons is well represented by Poisson distribution.

1) Given a threshold of detection T find the probability of detection: $p_\lambda = P\left[S_i \geq T\right]$

$$p_\lambda = P[S_i \geq T] = \sum_{k=T}^{\infty} e^{-\lambda/N} \frac{(\lambda/N)^k}{k!}.$$

Exercise 1: Gigavision camera

2) Knowing the expected count (E[C]) derive the incoming flux.

$$E[C] = Np$$

$$p(0) = e^{-\lambda} = 1 - p = 1 - \frac{E[C]}{N}$$

$$\lambda = -N\, log\left(1 - \frac{E[C]}{N}\right)$$

Gigavision camera