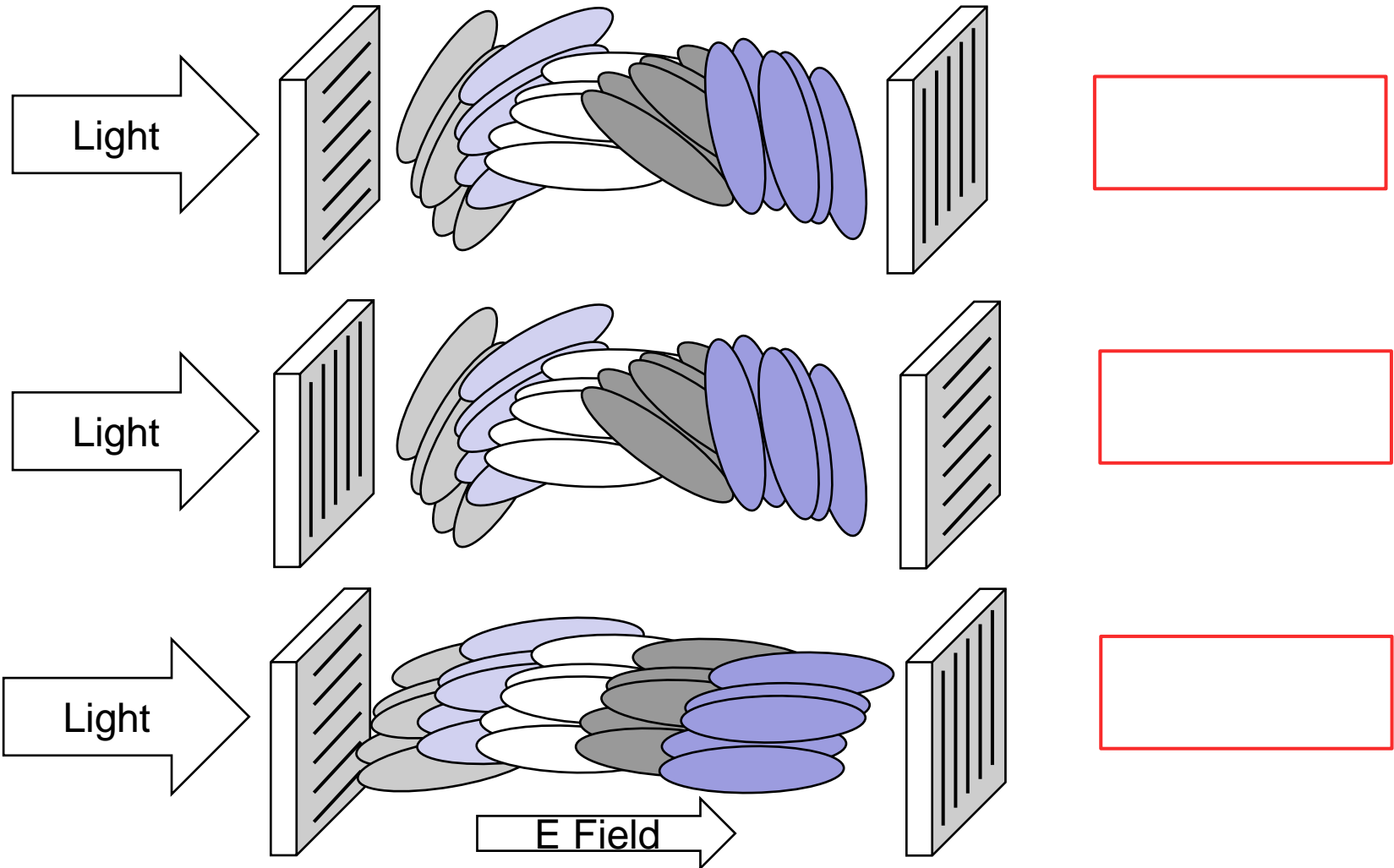


EE 4980
Modern Electronic Systems

HW 1

1) Assuming a Twisted Nematic Liquid Crystal – indicate the polarity of light exiting the structure: Horizontal, Vertical, None
10pts



2a) Determine the difference in time for a specific individual pixel to update comparing a 1080p display operating at 120Hz and a 1080i display operating at 120Hz

5 pts

2b) What is the fundamental physical principle behind E Ink operation

5 pts

3) You have been assigned the job of sizing the Cell capacitance of a new OLED pixel cell. This cell will be used in a 1080p display operating at a 60Hz refresh rate. 20pts

Design Requirements:

Maintain 95% programmed brightness between refresh cycles at 75% of peak brightness

Known Parameters:

Peak programming voltage = 8V

Parasitic capacitance on the source follower gate node = 5fF

Parasitic leakage on the source follower gate node is 0.5pA

Design Understanding:

Brightness is proportional to diode current

Diode current is proportional to the gate voltage of the source follower

4) You have been asked to design a VERY simple circuit to determine the direction of motion for the quadrature output of a mouse 15pts

Design Requirements:

Forward or Backward. (don't over complicate it – direction only)

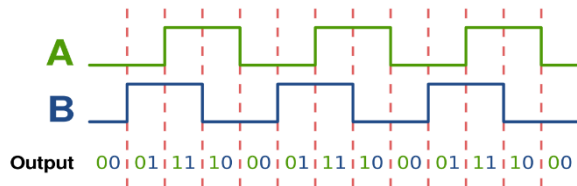
Available signals:

A, B

Explore several design spaces – there is a truly simple solution

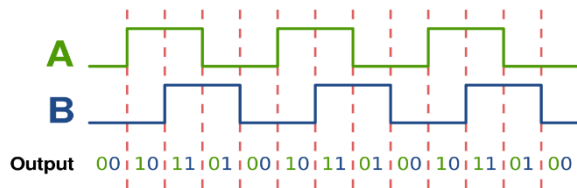
Forward rotation

B "leads" A



Backwards rotation

A "leads" B



5) You have been tasked with calculating the required frame rate for a new optical mouse design 15pts

Design Requirements:

Motion up to 25ips must be supported

System Specs:

20 x 20 sensor

Sensor resolution = 400 cpi

4x4 pixel minimum required to attain correlation

Search and Think

10 pts

Samsung advertises a QLED screen: give a short description of how this differs from the displays we discussed

Search and Think

10 pts

Identify a major concern for OLED displays wrt longevity

Search and Think

10 pts

Identify 2 major differences between OLED and micro-LED technology