

## Structured Electronic Design, Exercises 2

(This exercise was also used in a Bsc. Course. You do not have to work on it twice)

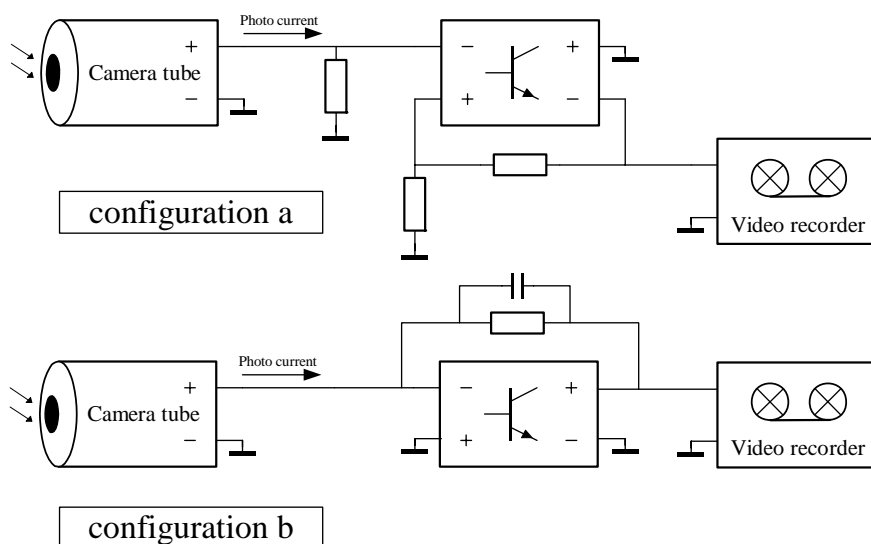
You can work on these exercises during the entire lecturing period. You will not find solutions on Blackboard yet. Some will be made available later. However, it is better to discuss your answers with other students and the professors. You will learn much more.

In older professional video cameras a photosensitive vacuum tube is used that converts the image into a small photo *current*. A low resistance to obtain good linearity and high bandwidth of the video signal must terminate the tube. The video signal is recorded by a video recorder that needs a large voltage input. A high gain is necessary to reach a sufficient signal level for the recorder. Two different amplifier configurations are suggested.

“Configuration a” is a commonly used circuit in these old cameras in which a resistor with a low value terminates the tube. A voltage amplifier amplifies the voltage across this resistor to a level that is sufficient for the video recorder.

“Configuration b” is a more modern concept that could unfortunately not be used because of a bandwidth problem. The feedback resistor in “configuration b” had such a large parasitic capacitor in parallel that the bandwidth of the amplifier became too low.

Unfortunately, the cameras were not suitable for low-light situations (too noisy image), although the sensitivity of the camera tube itself was more than sufficient.



- Explain which configuration is in principle the optimal choice.
- Discuss the degree of “orthogonality” between noise, distortion and bandwidth properties for each configuration.
- Explain why “configuration a” is more likely to cause a noise problem than “configuration b”.
- Explain why “configuration a” seems to be insensitive to the parasitic capacitances in parallel with the resistors.
- Can a reduction of the value of the resistor in “configuration b” solve the bandwidth problem? What are the drawbacks?

Try to find a better solution than these two configurations.

