

## Exercise 2.1-3

### What does it take to build a 4 GHz Microprocessor?

▶ A typical **MOS** transistor of **200x** ( $x = 0 \dots 5$ ) vintage has a "gate length" (= distance between source and drain) of about **0.5  $\mu\text{m}$**  and is run at about **3 V**

- 1.) What is the mobility the material (= semiconductor) must have? Discuss the result for known mobility values and consider the following points
  - Transistor speed = device speed ??
  - Mobility range for a given material ??
  - Could we have powerful **PCs** without micro- or nanotechnology ??
- 2.) How could you increase the speed for a given material
  - In principle?
  - Considering that there are limits, e.g. to field strengths?



#### Solution