

## 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 for 4 GHz operation frequency? 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 principal?
  - Considering that there limits. e.g. to field strengths?



#### Solution