

Analog Electronics (HighRR version)

The course will give the participants some practical knowledge on analog electronics and its application to experiments in (not only) particle physics. The emphasis lies on the principles and not on the technology. The main topics are:

- Linear circuits: dc and ac analysis of most frequently used networks
- Operational amplifiers: ideal, non-ideal, error sources
- Negative Feedback: basic circuits, stability, noise, frequency dependent circuits
- Positive Feedback: Schmitt trigger, oscillator
- Comparator

The practical part will cover some of the basic circuits discussed theoretically + some amplifier and comparator circuits specific to particle physics:

- Simple RC and CR networks
- Signal propagation through coaxial cables
- Inverting and non-inverting amplifier
- Schmitt trigger and integrator
- Discriminator with comparator

Specific part:

- Shaping Amplifier and Pole/Zero cancellation (SA + P/Z)
- Single Channel Analyzer (SCA)
- Time over Threshold (ToT)
- Timing with Leading Edge & Constant Fraction Discriminator (LE & CFD)

All experimental circuits will be first discussed, then simulated with LTSpice IV and finally tested on a breadboard.

The participants will get an empty PCB with all specific circuits + the components. Depending on the

time available, they will solder their own PCB at the end of the course or later at the home institute.

