

# CO2 Measuring station Musée des Mines Rumelange



# CO<sub>2</sub> can be dangerous in mines





# Effects of CO2

- 400ppm: value in normal air
- 1000ppm: concentration can be lowered
- 5000ppm: International safety limit (long term)
- 15000ppm: Short time exposure limit
- 20000ppm: 50% increase of breathing frequency
- 30000ppm: breathing frequency doubles, dizziness + headache
- >50000ppm: confusion, unconsciousness

source: <http://www.analox.net/carbon-dioxide-dangers.php>

# CO<sub>2</sub> is coming from French mines

- Lux. mines are connected to the French mines
- Many 100km of galleries
- French mines get flooded and push CO<sub>2</sub> upward
- CO<sub>2</sub> > 20000ppm in some mines



# First ideas in 2009

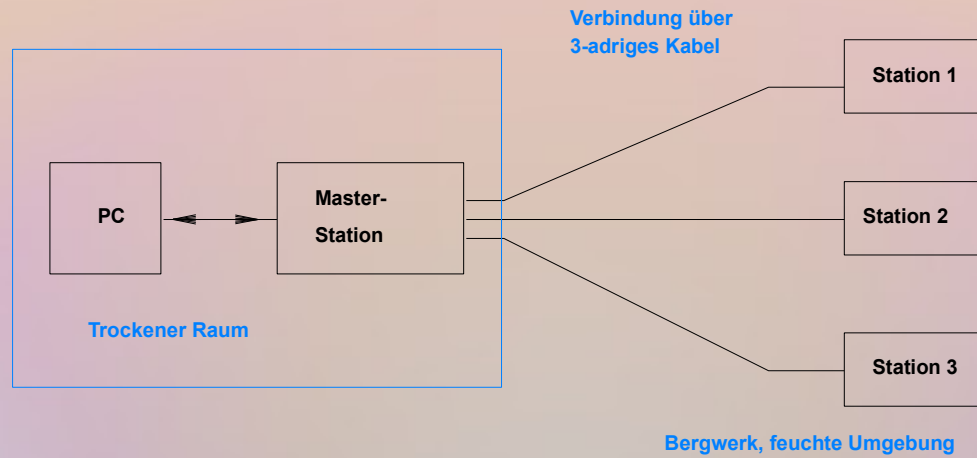


- A CO2 sensor from Senseair and a uC are the basis of a portable measuring device
- Why not a student project together with the Musée des Mines?

# The location



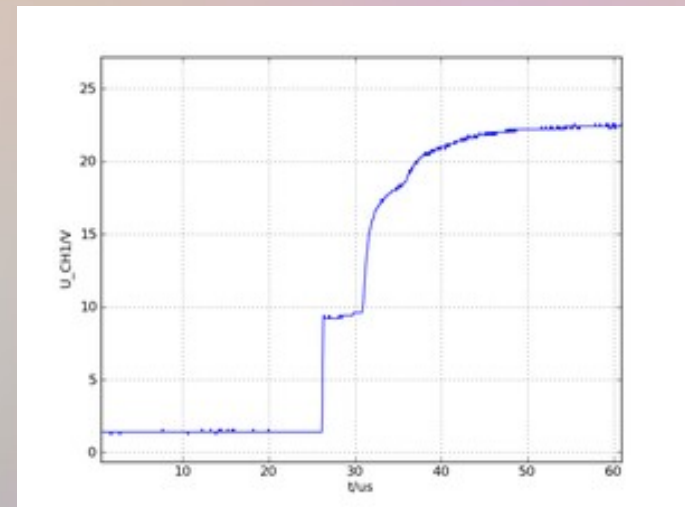
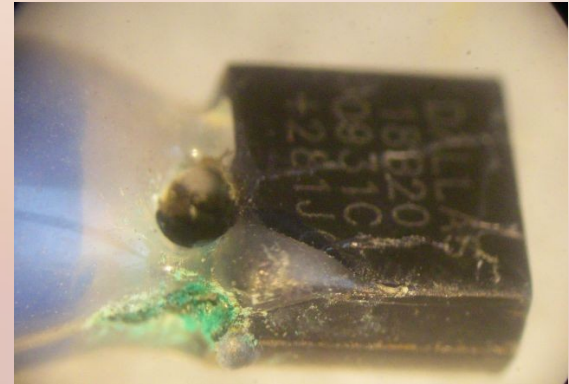
- Project idea:



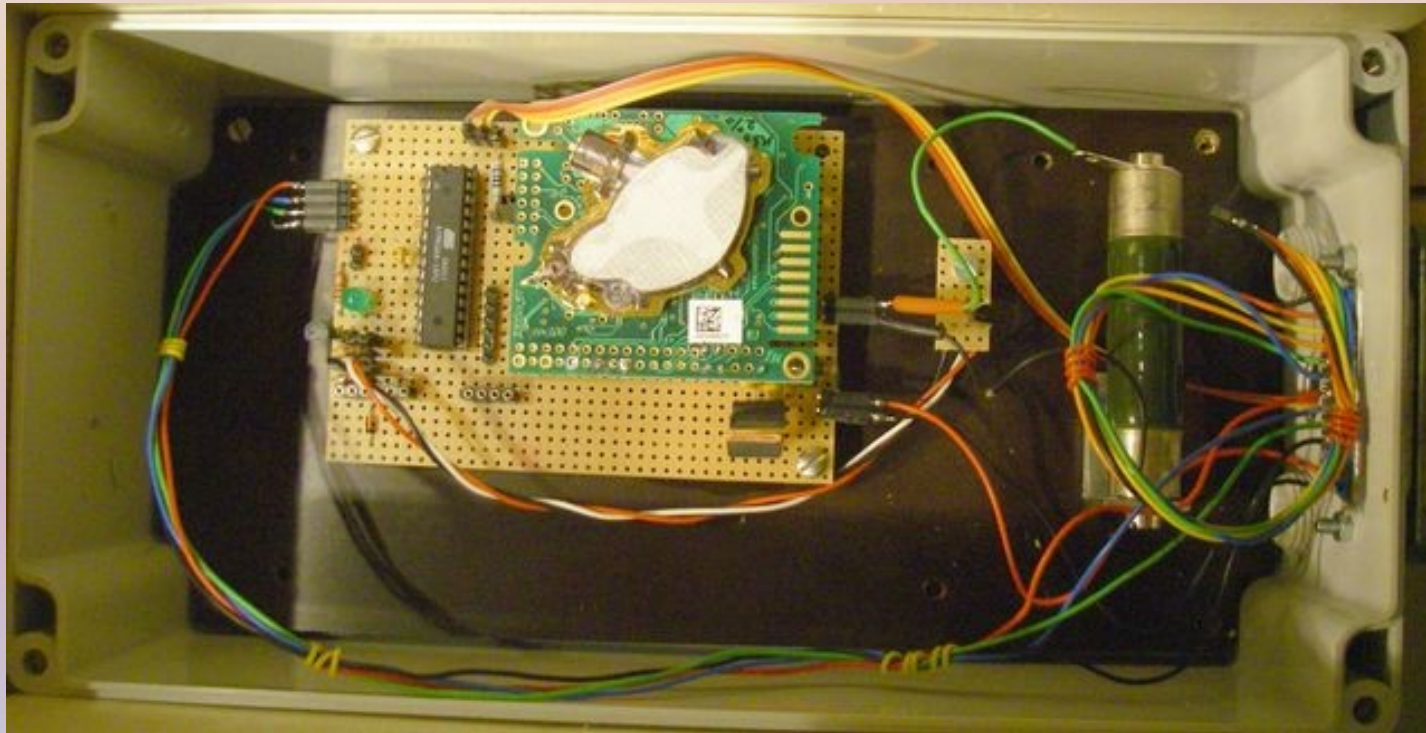


# There might be problems...

- Corrosion
  - Inside temperature must be regulated
- 1 wire for data to and from station
  - TxD/RxD switching
- Reflections on the cable

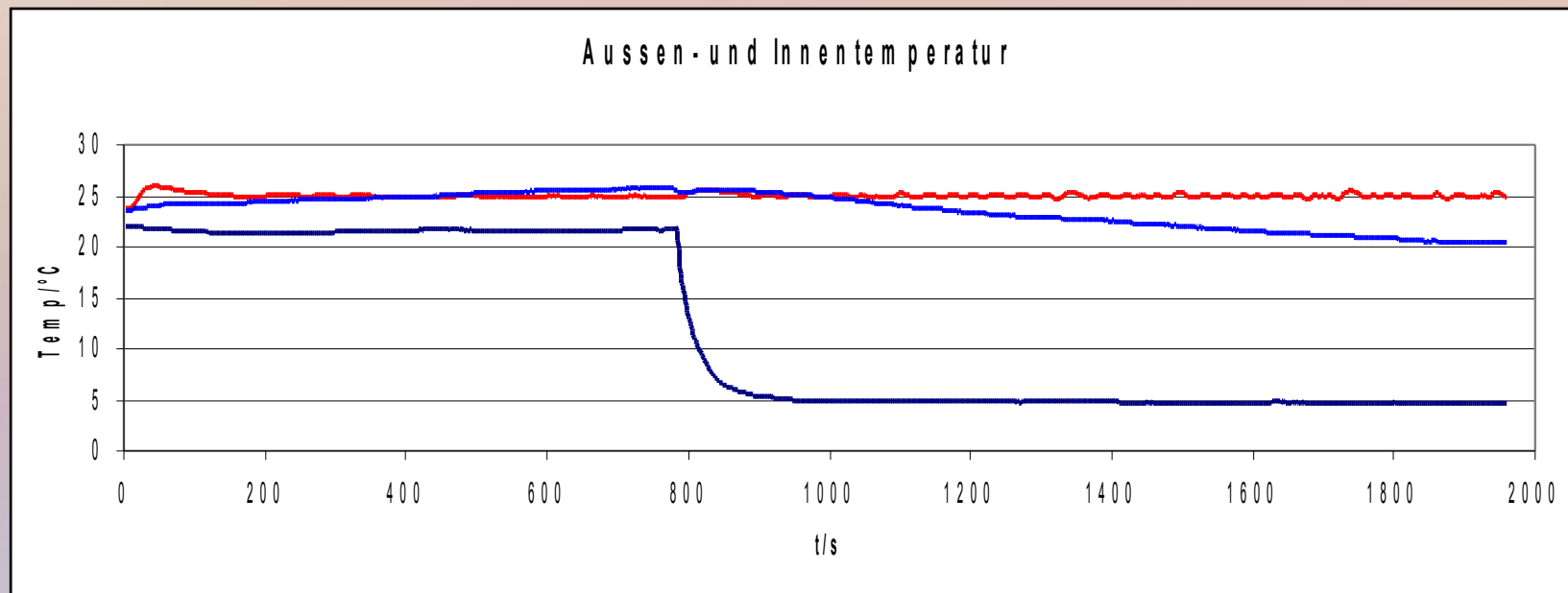


# Measuring station prototype 2010



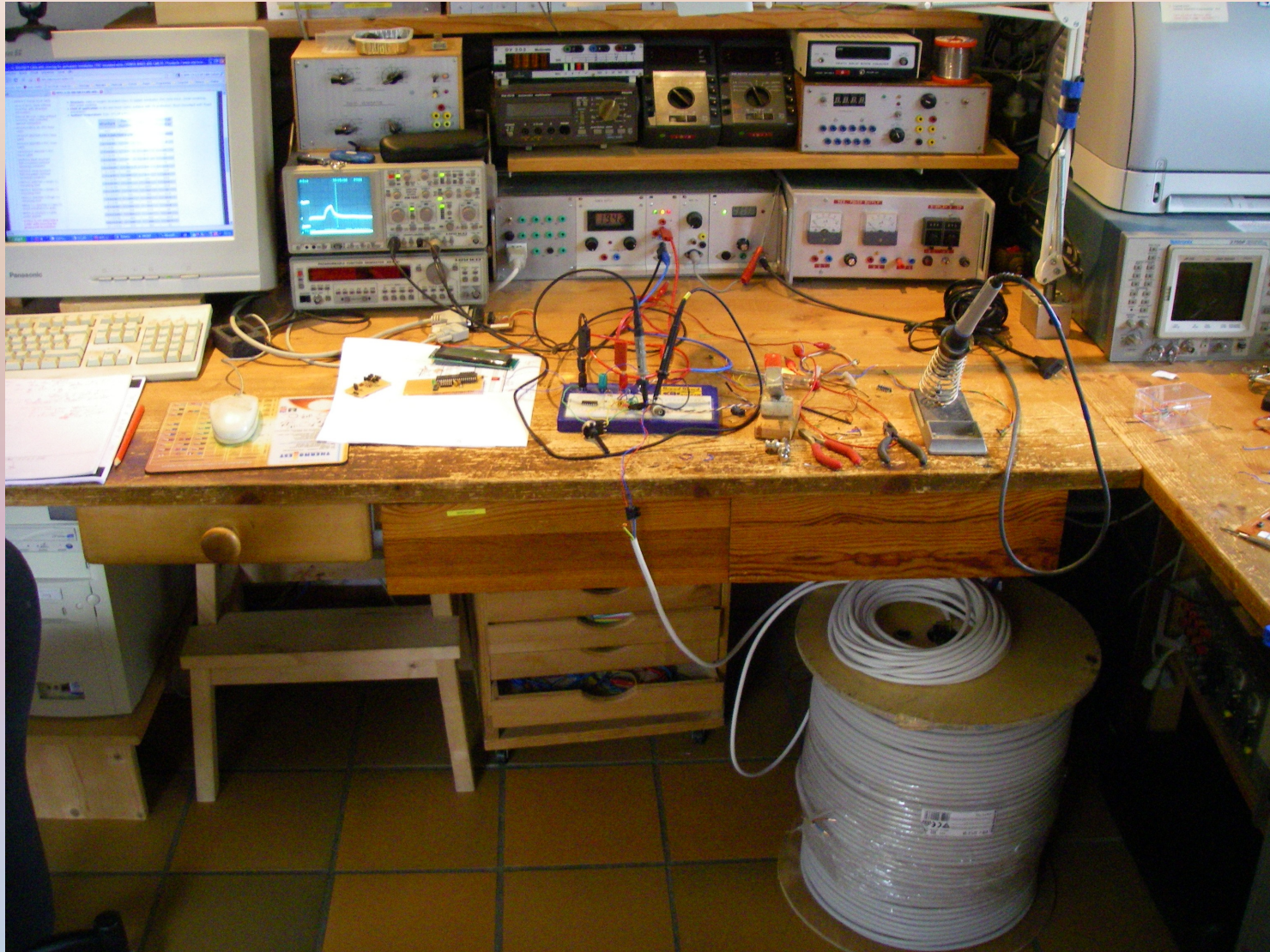
# Temperature regulation test

- If it works at 5°C, it should work in the mine!



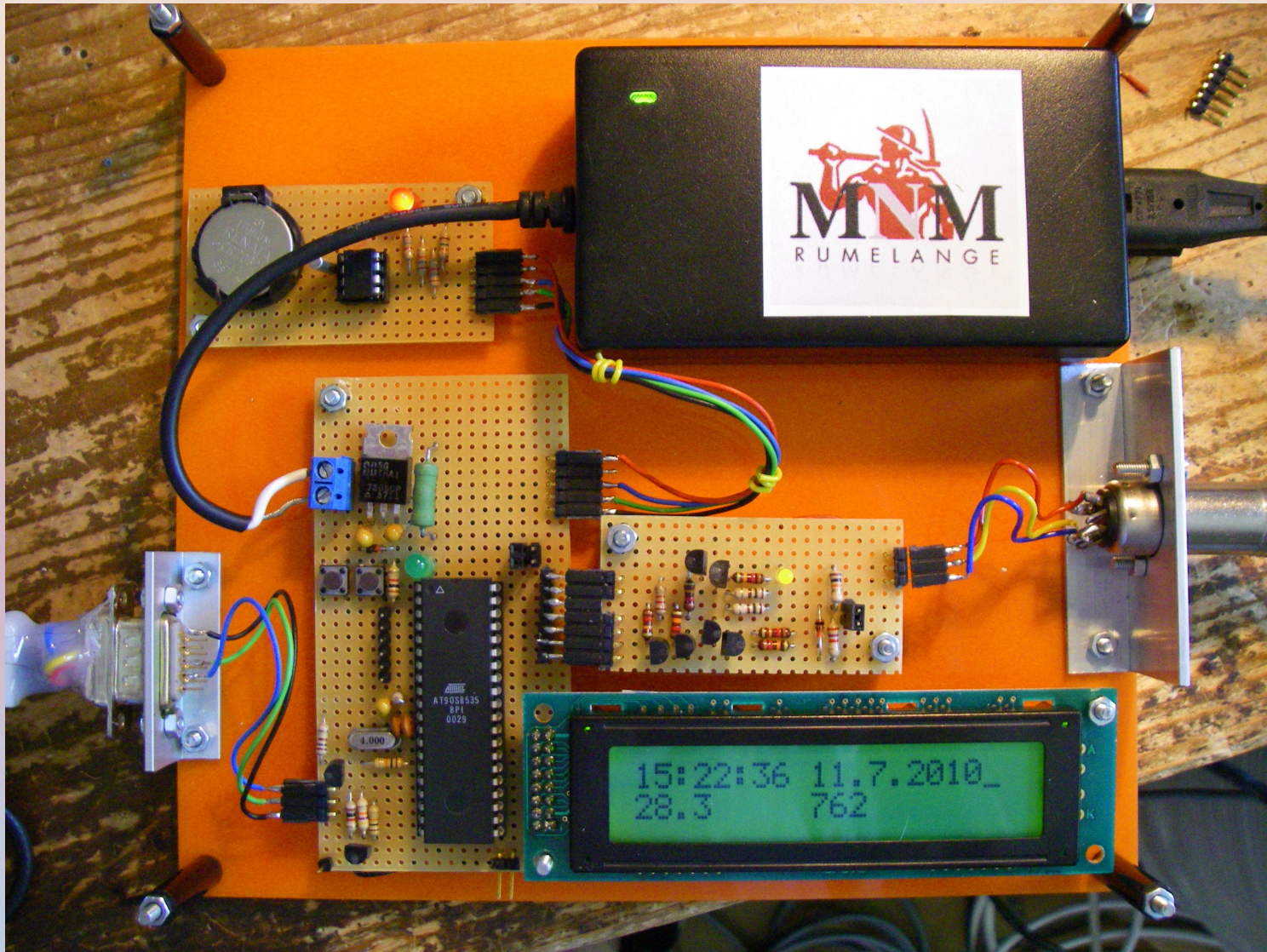


# Cable reflection test





# Master station prototype





# Laying out the cable





# Laying out the cable



# Laying out the cable



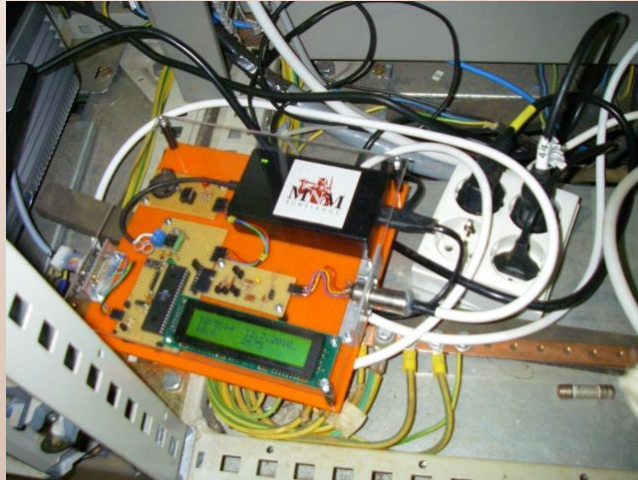


... and installing  
the prototype





# Installing the master station prototype



# Ready!





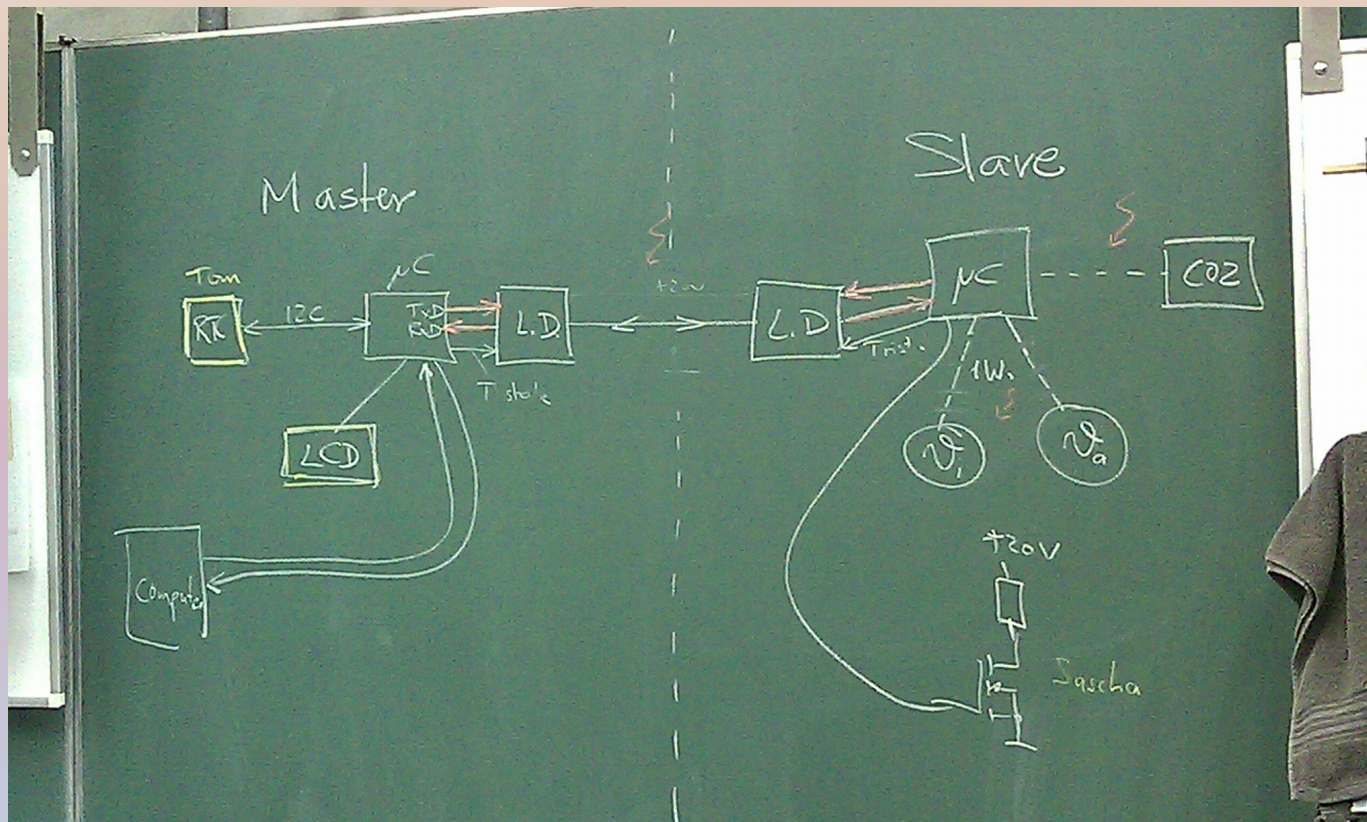




# Project group 2010/2011

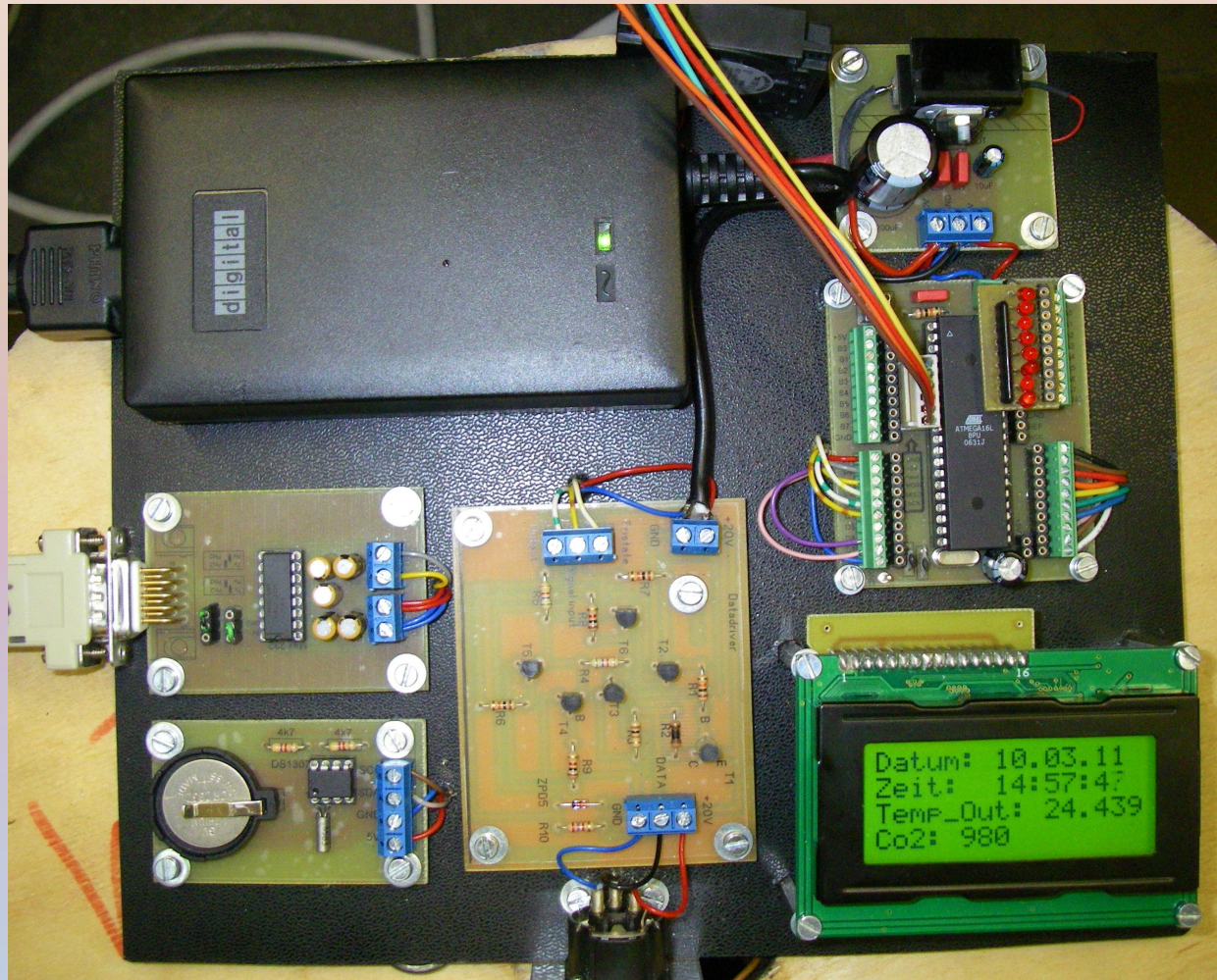


# Distributing the tasks



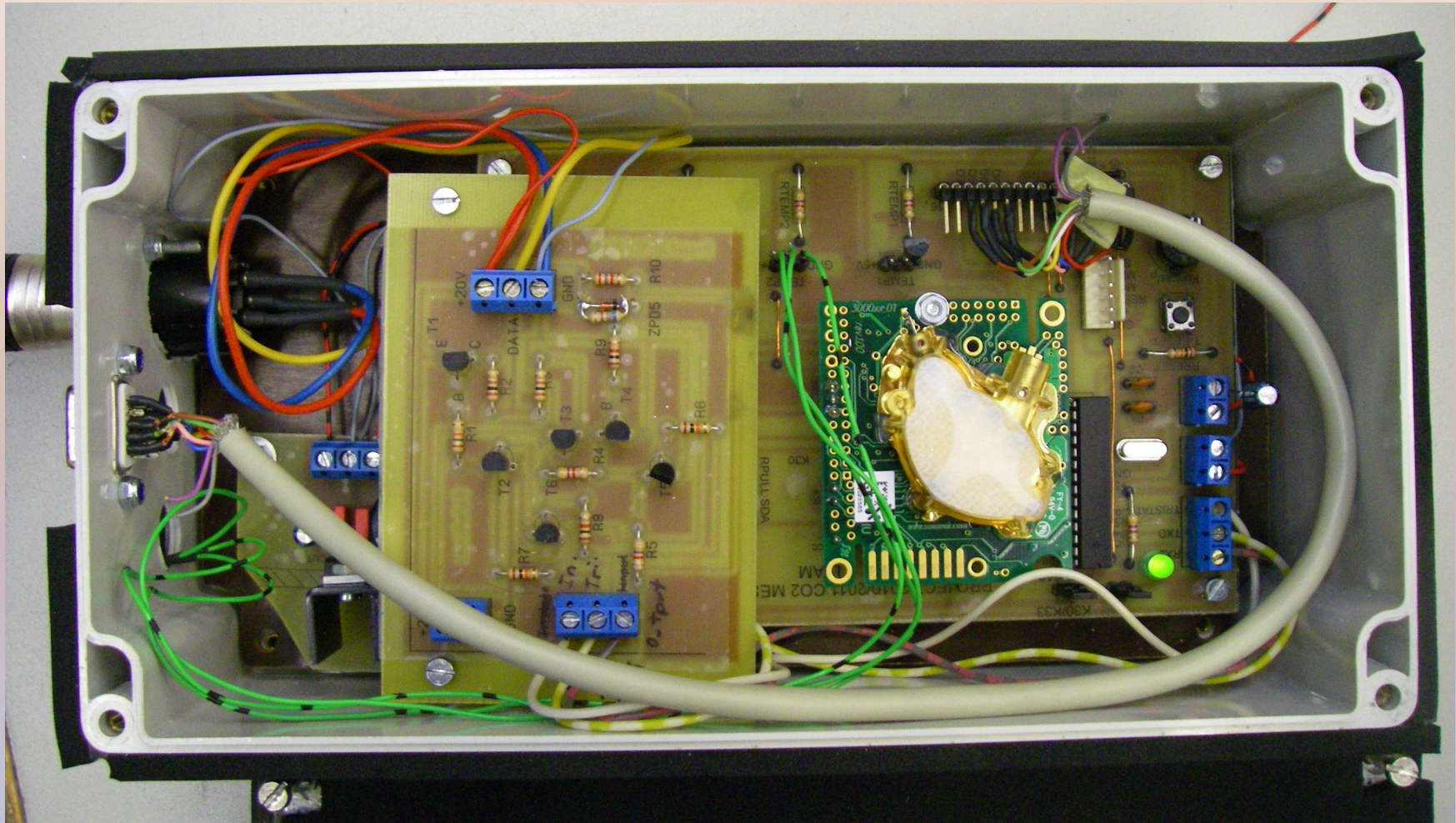


# Master station built by students





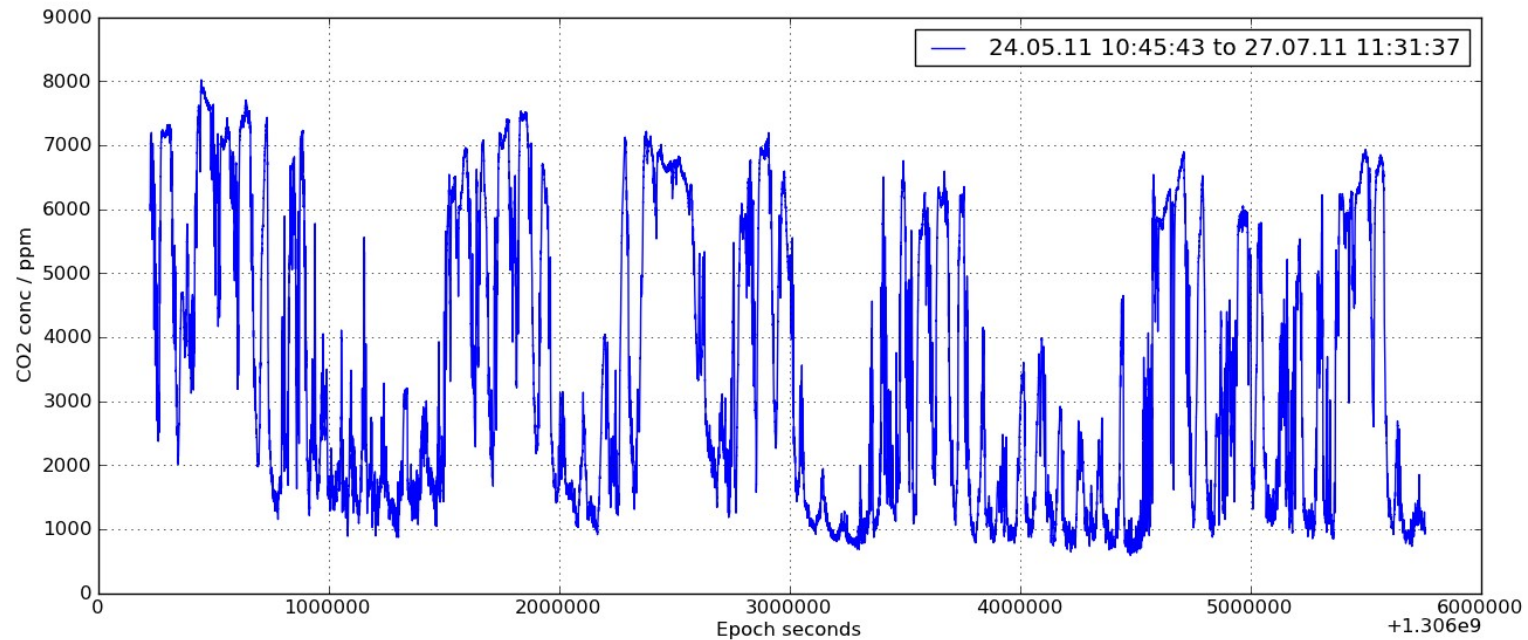
# Measuring station built by students







# First results with student's system



- There is a daily periodicity
- CO2 concentration is sometimes rather high



# Champagne in the mine

