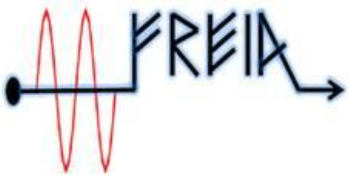


Weather Station

PHYSICS PROJECT WITH A RESEACH BASIS 5c

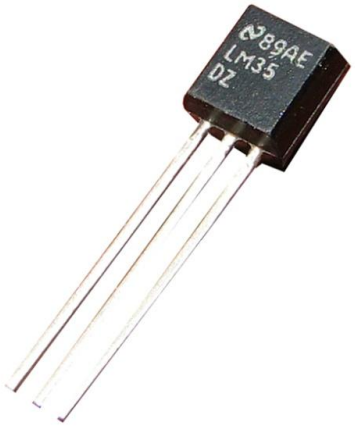
Frida Bäfverfeldt

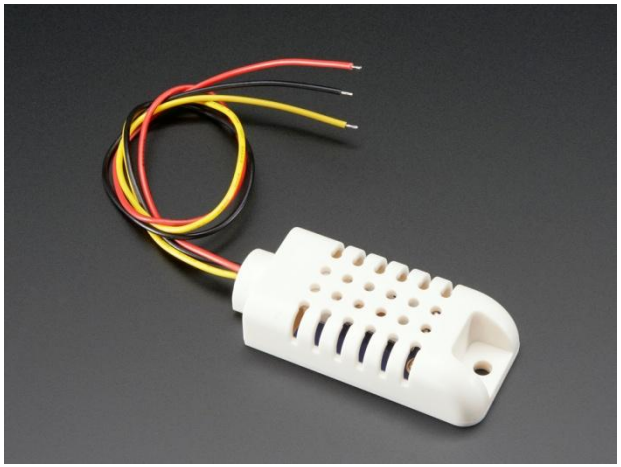
Supervisor: Volker Ziemann

Introduction

- Why does FREIA need a weather station?
  - Weather effects measurements (pressure vessels etc)
- Why am I the one building this device?
  - Physics project with a research basis 5c
- What will I talk about today?
  - Hardware and software.
  Sensors -> Device -> Control system

Sensors



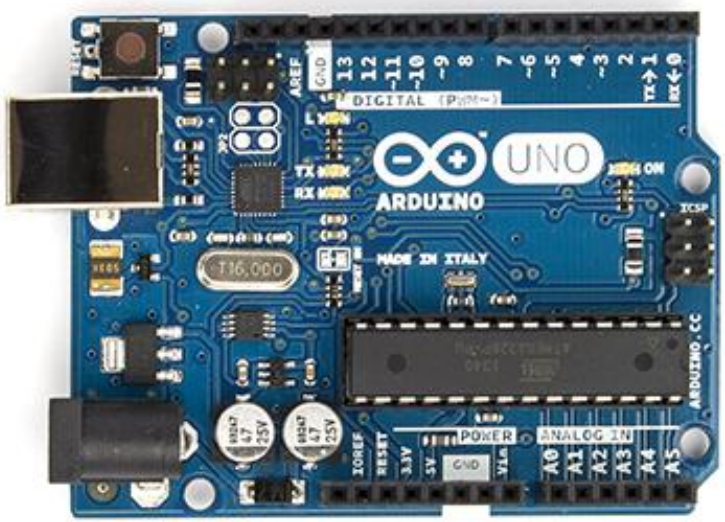


LM35 – Temperature (Analog signal)

DHT22 – Relative Humidity & Temperature (Proprietor Digital protocol)

BMP280 – Pressure & Temperature (I2C Standard)

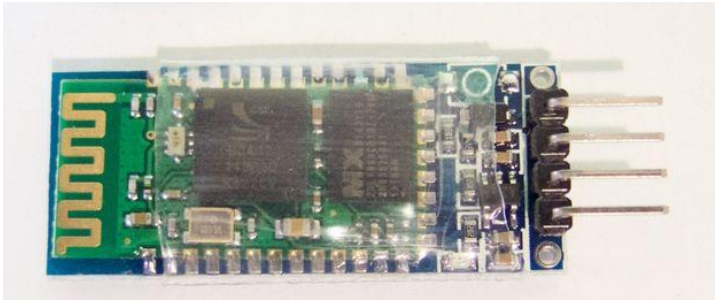
Processor and Communication



Communication within the device
- I2C, analog, etc

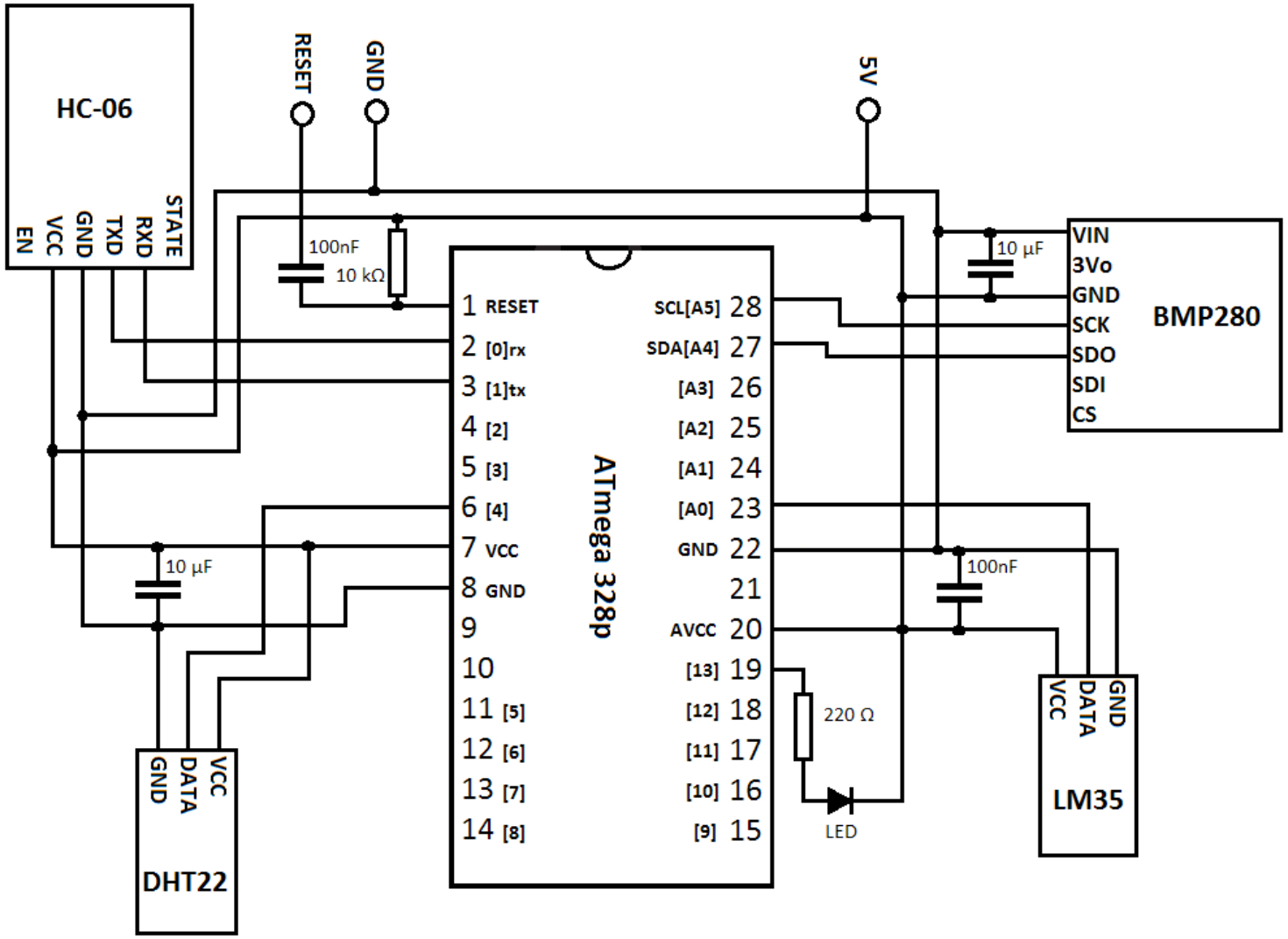
Arduino!

Communication to/from device
- Serial (RS-232)

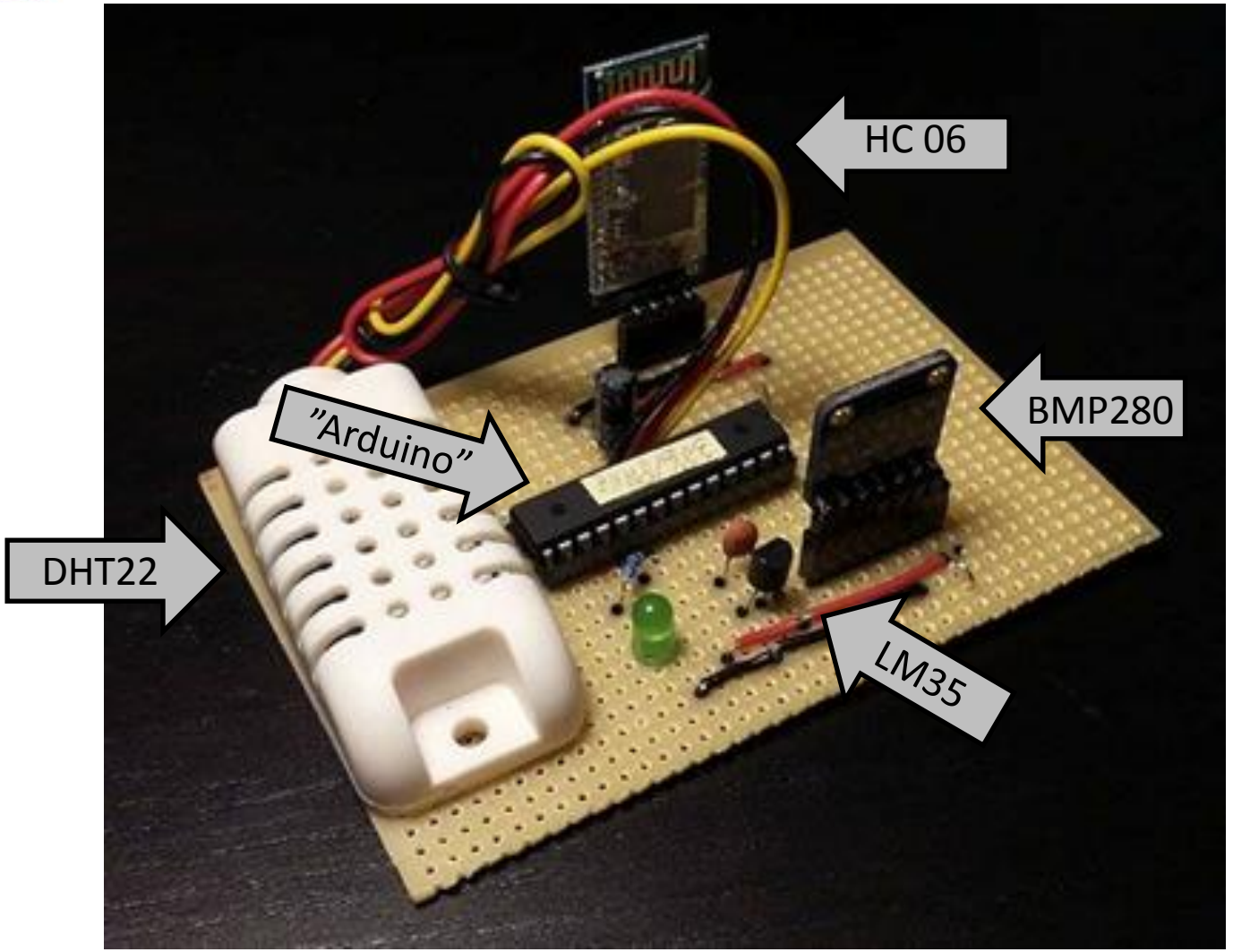


USB cable
HC-06 bluetooth module

Circuit diagram

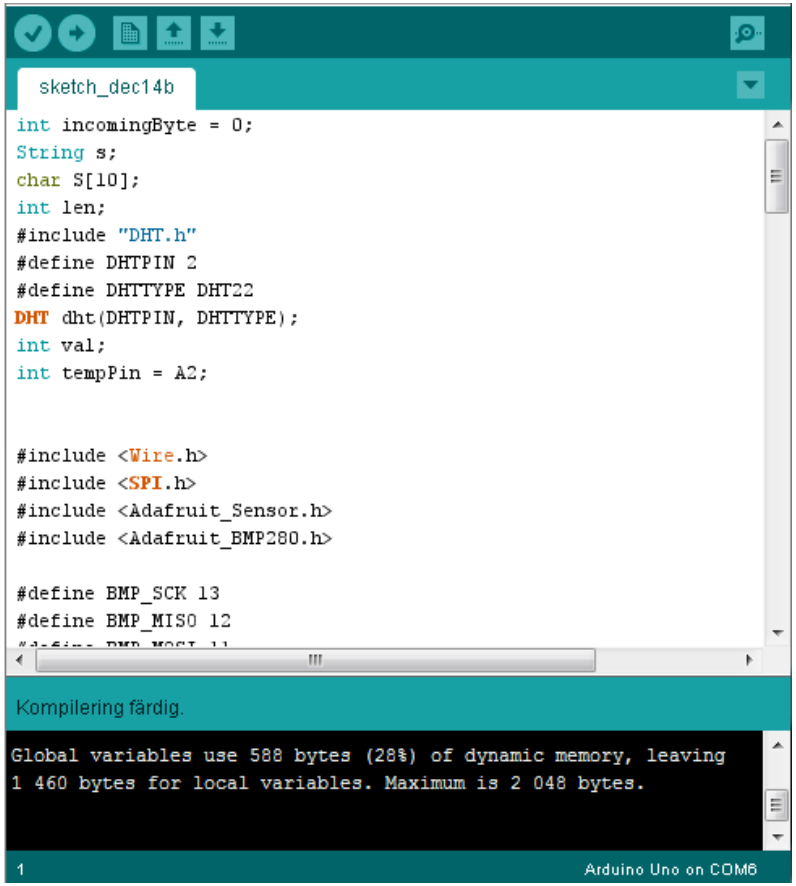


The finished weather station



Software - Arduino

Arduino language: based on C/C++
An executable program only needs two functions to run. setup() and loop().




```
if (Serial.available() > 0) {
  s =   Serial.readStringUntil('\n');
  char charBuf[50];
  s.toCharArray(charBuf, 50);

                :
}
```

```
if (strstr(charBuf, "TP?")) {
  Serial.print("TP ");
  Serial.println((float)bme.readTemperature());
} else  if (strstr(charBuf, "P?")) {
  Serial.print("P ");
  Serial.println((float)bme.readPressure());
}
```

Communication

Command	Respons	Description
T?	T x	Temperature in ˚C , meassured by LM35 sensor
TH?	TH x	Temperature in ˚C , meassured by DHT22 sensor
TP?	TP x	Temperature in ˚C , meassured by BMP280 sensor
H?	H x	Relative humidity in %, meassured by DHT22 sensor
P?	P x	Pressure in Pa, meassurd by BMP280 sensor

Where x is the numerical value returned by the sensor.

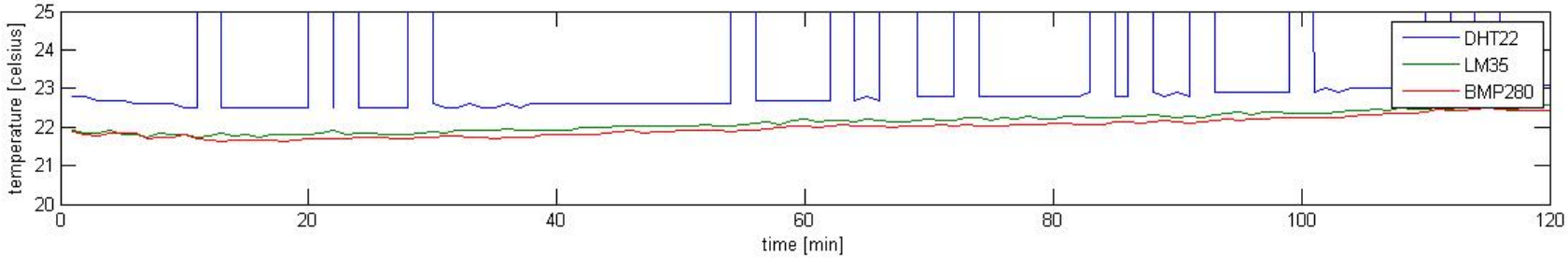
EPICS

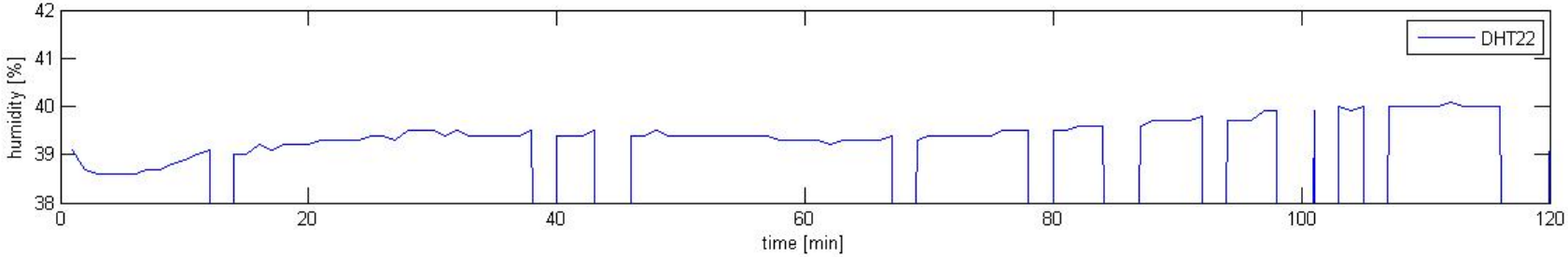
```
get_pressure {
out "P?";
in "P %f";
ExtraInput=Ignore;
}
```

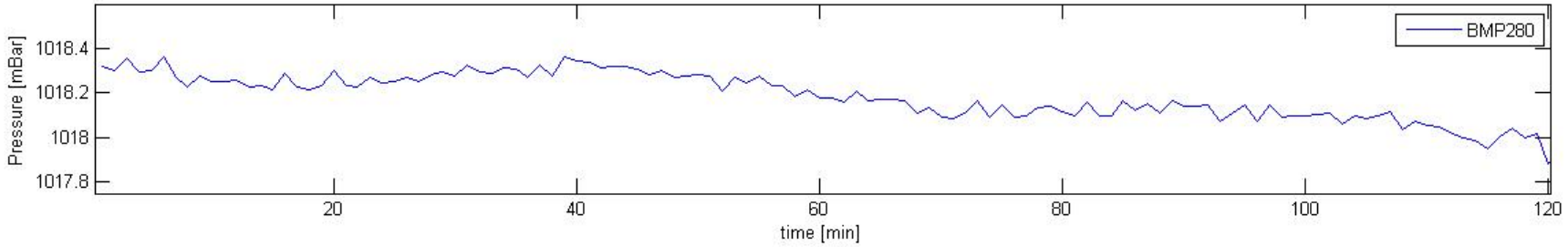
```
record(ai, "$(DEVNAM):Pressure") {
  field(DESC,"Pressure in mbar")
  field(SCAN,"10 second")
  field(DTYP,"stream")
  field(INP,"@weather2.proto get_pressure $(PORT)")
}
```

Results

MATLAB

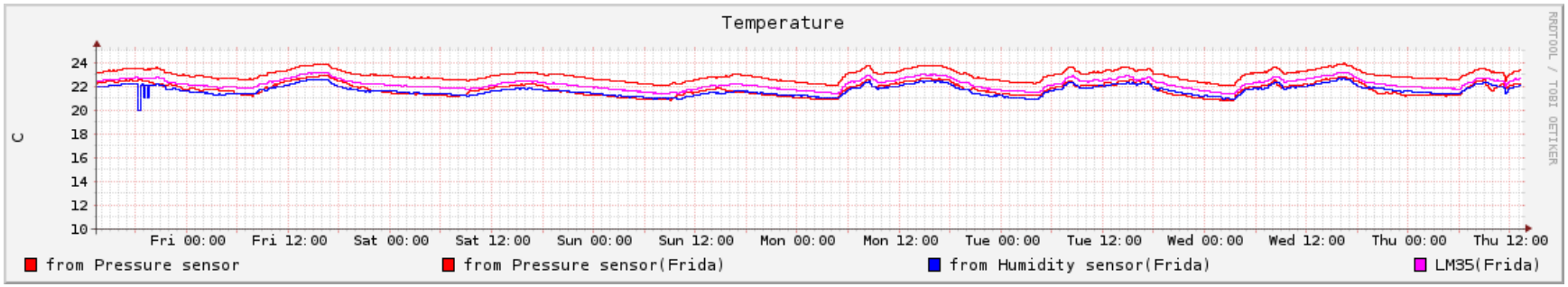


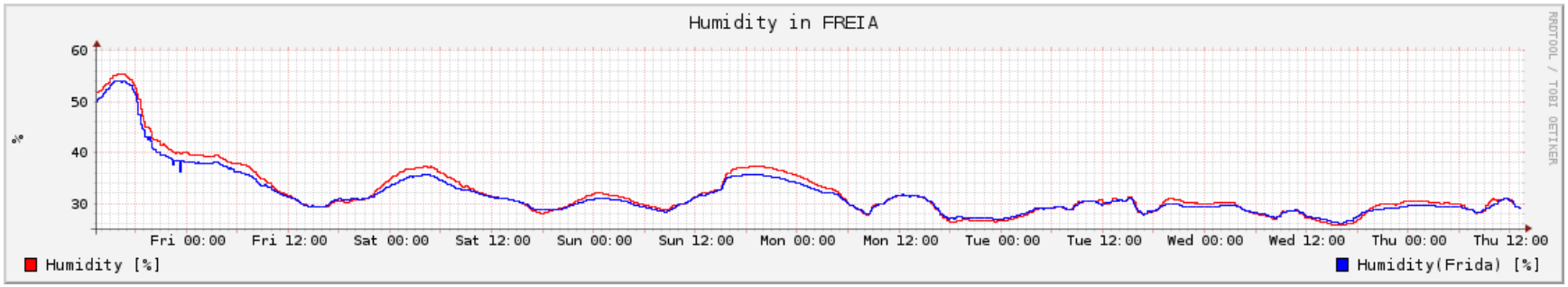


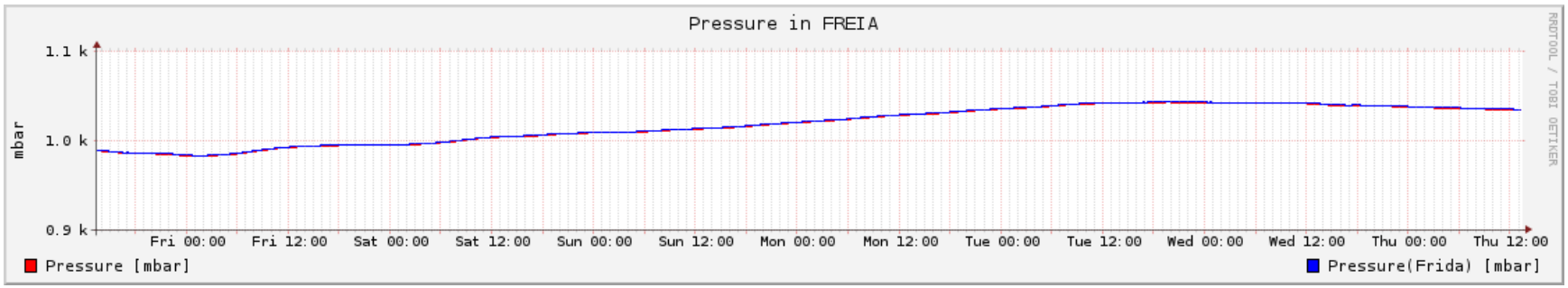


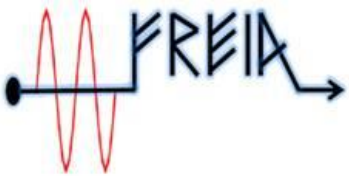
Results

EPICS









THANK YOU FOR YOUR ATTENTION

Questions?

Full report available at: http://www.diva-portal.org/smash/get/diva2:974843/FULLTEXT01.pdf