# Prague test bench

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## 1) The test rig you have or will have soon implemented.

Our test bench is designed for environmental stress screening (ESS) and Burn-in procedure. The experimental setup consists of a climate chamber Binder MKFT115 with a sufficient volume to test 10 UUBs in one batch. The boards are powered by Rohde&Schwarz HMP4040 via a unit, which allows us to monitor the current drawn by each UUB or switch off a failing UUB. The test pulse is produced by AFG3252, sent to the distribution board and further to all the signal input connectors on all 10 boards. The data acquisition and readout is conducted via ethertnet connection using Mikrotik RouterBoards RB750r2 placed inside the chamber. The temperature inside the chamber is independently monitored by two sensors BME280 (every 30 seconds together with ZYNQ temperature and SC values).

## 2) What parameters are measured?

- **Noise** - pedestal and RMS of the pedestal from the bins 50 – 550 of each trace (suggested cuts LG 0.01- 1.0 ADCc, HG 0.01 - 2.3 ADCc)
- **Linearity** - a signal (five half-sines) is issued with six different amplitudes for LG (0.3V, 0.6V, 0.9V, 1.2V,1.5V, 1.8V), for HG divided by 32, for Ch9 multiplied by 4, amplitude gain LG 2.05 ADC/mV, HG 65.5 ADC/mV, LLG 0.51 ADC/mV. (suggested cuts ±5%)
- **Frequency** - a signal (sine wave with a phase offset LG $1.6V_{pp}$, HG $50\text{mV}_{pp}$) is issued with six frequencies (10 MHz, 20MHz, 30MHz, 40MHz, 50MHz, 59MHz), cut-off frequency is found by extrapolation, where the amplitude falls by 3dB (suggested cuts $55MHz < Fcut < 65MHz$)
- **Ramp** - analog input disabled, a command issued to ADC to generate a ramp (SPI)
- **Hot/cold start** - in the last cycle at +70°C - power OFF → power ON with 32.4V, -20°C - power OFF → power ON with 19.1V
- **Accelerated ageing** - powered boards (24V) are left at +70°C for 16-20 hours, temperatures (ZYNQ, chamber) and SC values monitored regularly

## 3) What are the temperatures they will be measured at?

10 cycles, -20°C to +70°C, every 15°C ( -20, -5, 10, 25, 40, 55, 70 – up and down)

## 4) What is not covered in your testing plan?

Many other tests apart from the above mentioned.

## 5) What will be put into the data base?

- A thermal image of the powered UUB at room temperature. (Microscope image of a specific location can be added, if needed.)
- A summary table of all tests and their status.
- ZYNQ, BME280 temperature readings, SC values and power consumpion during the whole procedure.
- Pedestal and noise at each measurement point.
- Amplification gain at each measurement point for each channel.
- Frequency response and Cut-off frequency at each measurement point for each channel.
- Pass/fail status of Ramp test at each measurement point.
- Pass/fail status of power-on at high, low temperature.
- Pass/fail status of Burn-in test.

## 6) What are the goals of your test bench?

Accelerated stress, performance over specified temperature range

## 7) Where will the tests be performed?

Institute of Physics, Prague

## 8) Other possible tests?

- Humidity cycling RH 10% - 90% ($\sim$ 2 weeks) on 10% of the boards at the Institute of Physics, Prague
- Salty fog on 10 - 20 boards at VSB, Ostrava