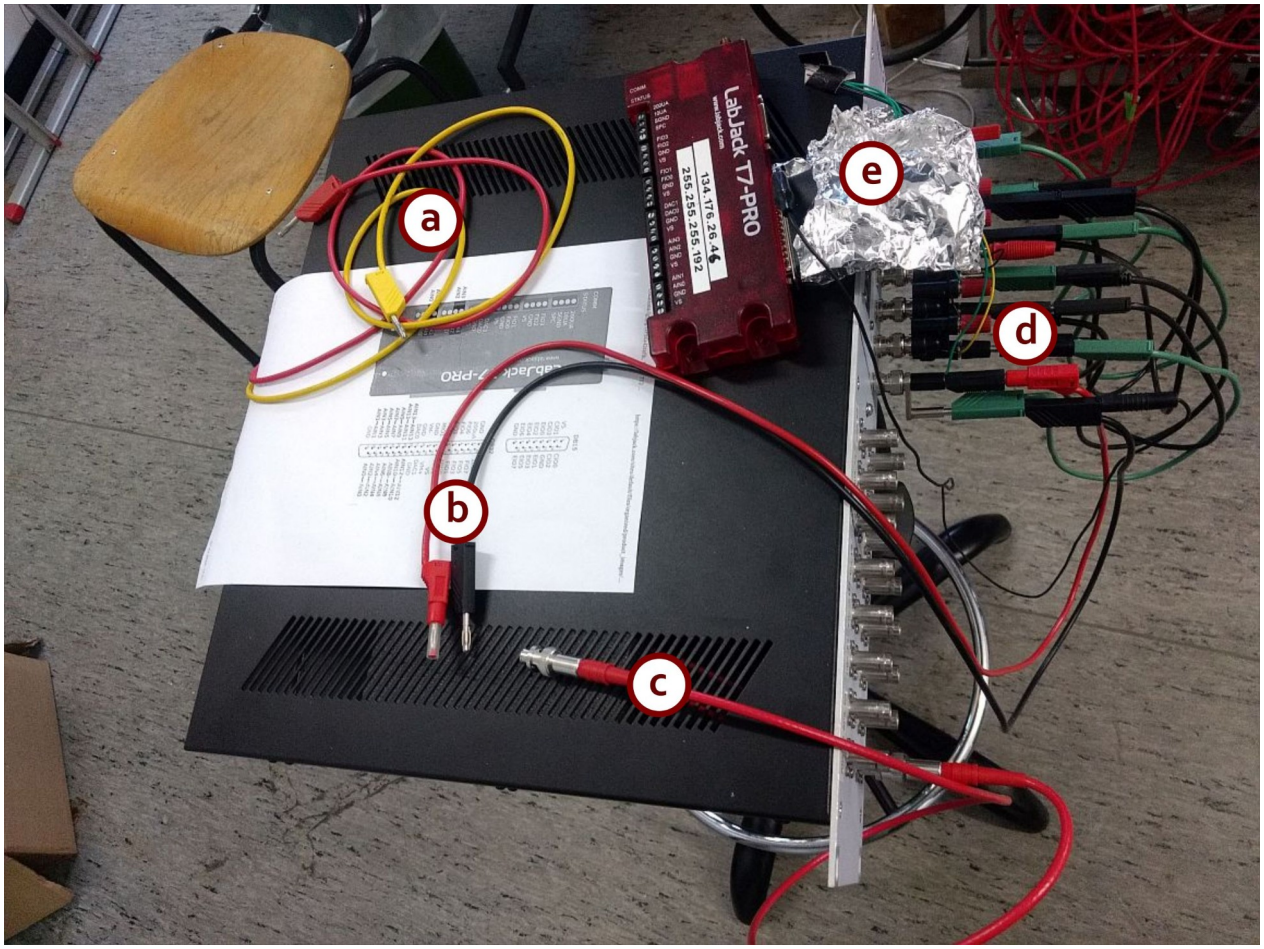
Setup 8Ch Voltage Divider Tests at MoToF (Gießen)

Measurements 12.10.2020 – 25.11.2020, Julian Bergmann

Setup

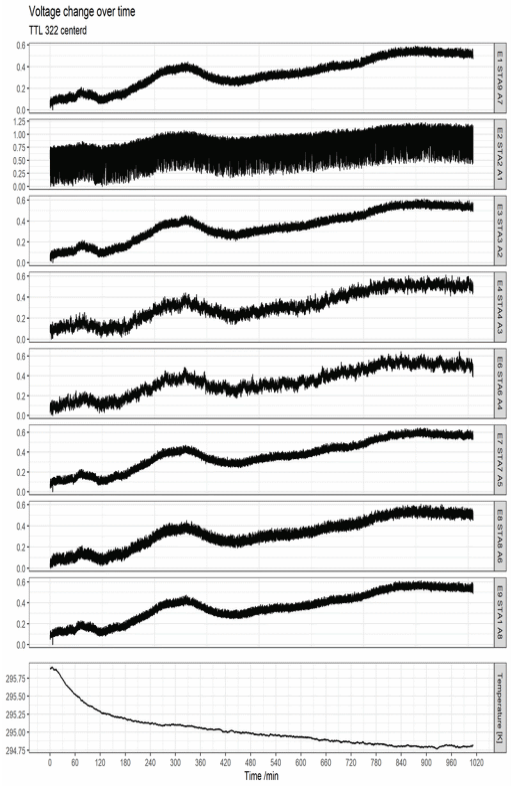


a) Temperature Regulation Power Supply. Must not be plugged in since it can cause jitter in read out values
b) Ch1 connection to Keithley Precision Multimeter
c) Only Upper SHV Plug connected to STA output For E1-4/6-8. When tested other Voltages (E5, Drift, MRS) were connected in Line using the second SHV-connector for each channel.
d) Divider-Readout BNC was connected to BNC-Banana adapters. All GND Banana connectors were connected to each other and to the GND of Labjack T7-Pro. Two possible sources of GND: SHV of Divider and USB of Labjack. The Data-Line was connected to the large parallel port with a self-made connector. Specifications for Labjack-parallel port are attached at the end. The data-lines were wrapped in aluminum foil as shielding which was connected to the GND connectors by a clamp. Labjack was connected to the PC via USB-B.

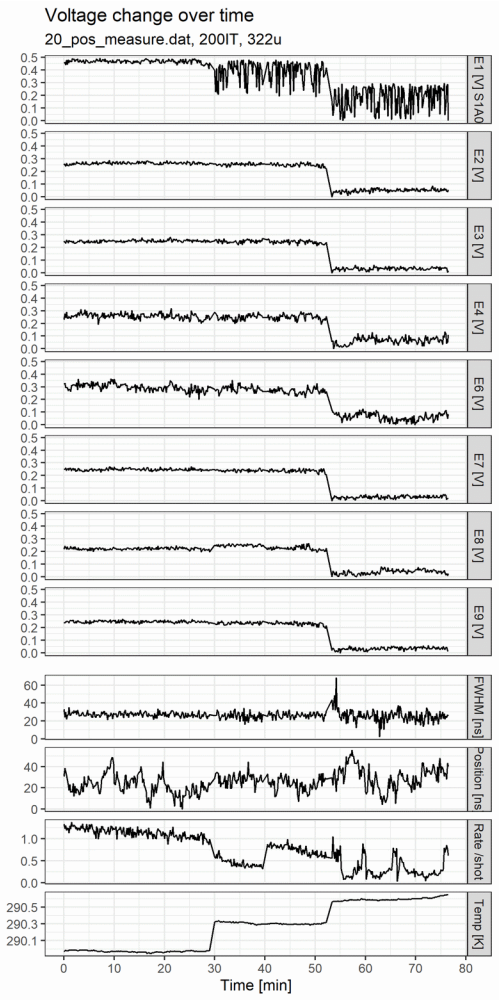
Analysis

Data was measured using Labjack-Server (which I improved a bit during working with it. Source-code is C++ Embarcadero, available in Gießen). It also has a live-preview plot of all active channels now.

The Server-Software can log input values and device temperature, which can be plotted in R with ggplot. (left picture)



However MAc can also access the values from the Labjack-server, so you can plot tof, fwhm and count rate directly in the MAc optimizer (or passive evaluation) (right picture). The resulting file can also be plotted in R or directly in MAc (“View Result”)



Special Case: MoToF

At the Mobile Time-of-Flight Mass spectrometer the Trap center is set to ground. This means E5/MRS/Drift is floated to -1300V. These are measured using the divider in line separately. It also means E4/6 are at -4600, which makes it necessary to set Labjack to a lower precision for those channels.

All Voltages are coming from ISEG power supplies with different precisions and polarities depending on the target voltage. No temperature isolated Matsusadas.

Measured masses were coming from n-ESI and usually heavy molecules (322u = 6C12:19H1:6O16:3N14:3P31:-1e, 622u = 12C12:19H1:6O16:3N14:12F19:3P31:-1e) with a somewhat unstable rate but ways to increase/reduce the rate in general.

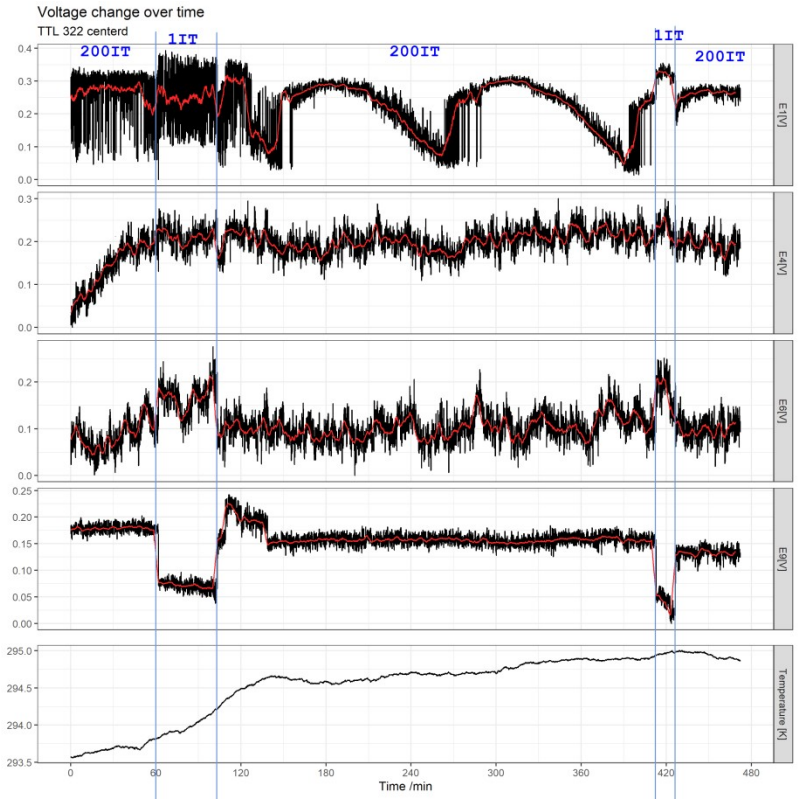
Result / Observations

The Labjack readout always shows a 4V too high signal (+14mV readout), regardless of GND, +300V or -1200V. This was subtracted in most measurements.

One channel was always jittering a lot spontaneously. I switched Pulsers, Divider-Channels and Labjack-Inputs separately and came to the conclusion that Labjack Analog-Input 1 has the jitter. It turned out to be good practice to note for each channel which stabilizer, electrode and LJ-Input is used.

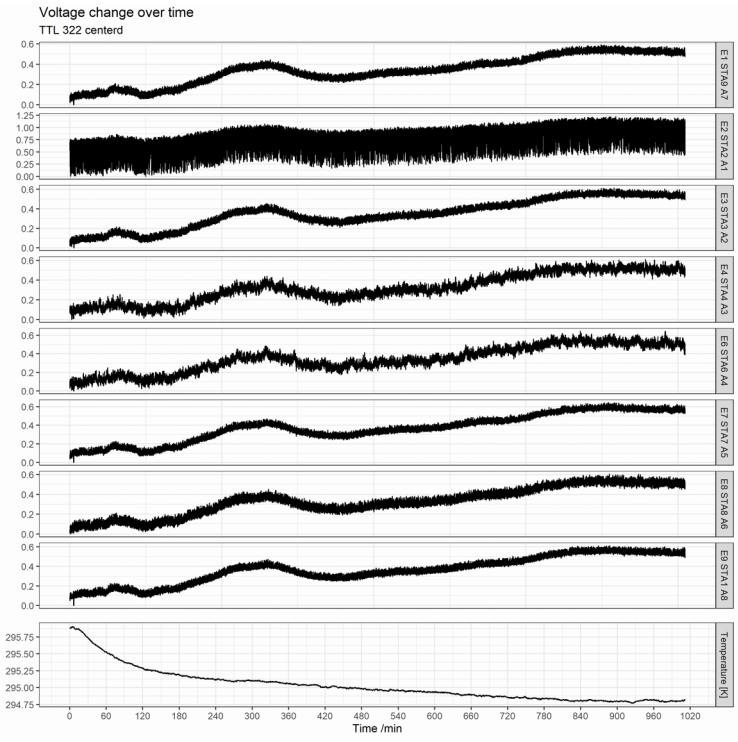
Temperature has a notable influence on the voltages. Changing the turn number also changes Mirror voltages slightly. The new voltages is kept, though, and not going back slowly to the old one.

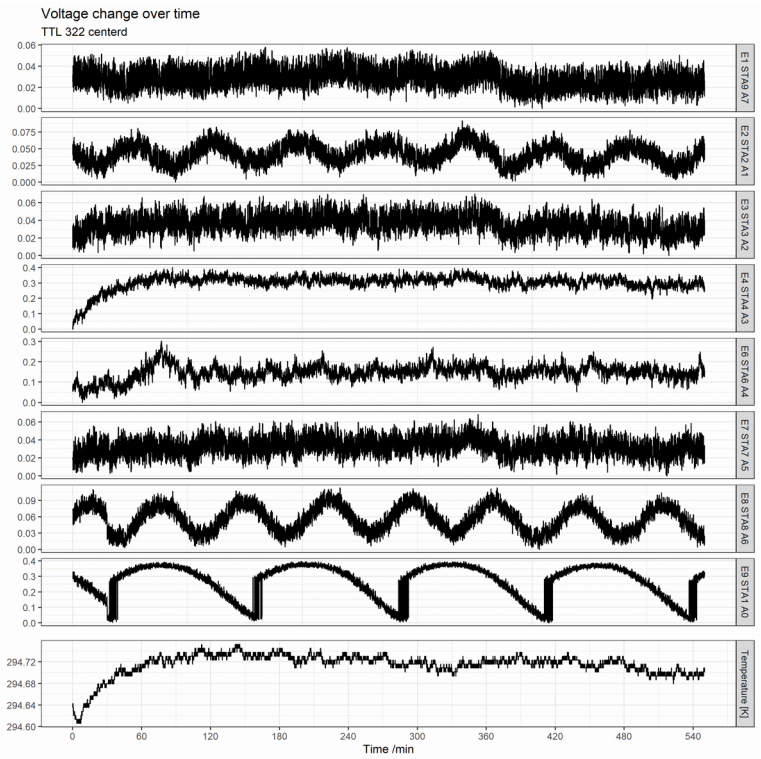
Sometimes a periodic charge effect with 2h period was seen. I was not able logging the tof-effect of this 0.2V shift. Changing pulsers also shows that it might be a pulser effect (Stabibox-1)



Comparison with Keithley precision multimeter Labjack is a lot less precise. This shows that Keithley should be used for absolute values while the divider is more suitable for shifts in time.

Applied	0 V	+100 V	+200 V
Labjack	14.3 mV	85.6 mV	185.7 mV
Keithley	0.03 mV	99.96 mV	199.93 mV





Labjack connector reference