

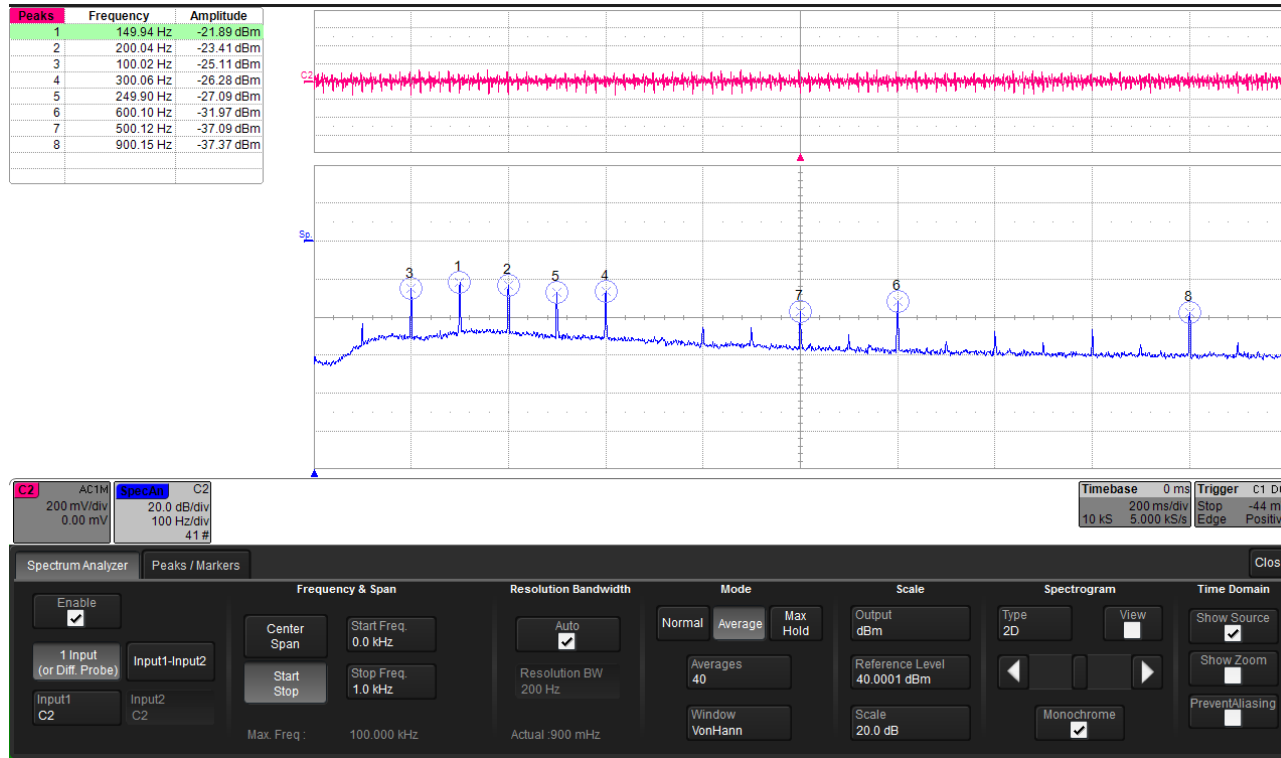


Finalizing circuit values

Hendrik Borras

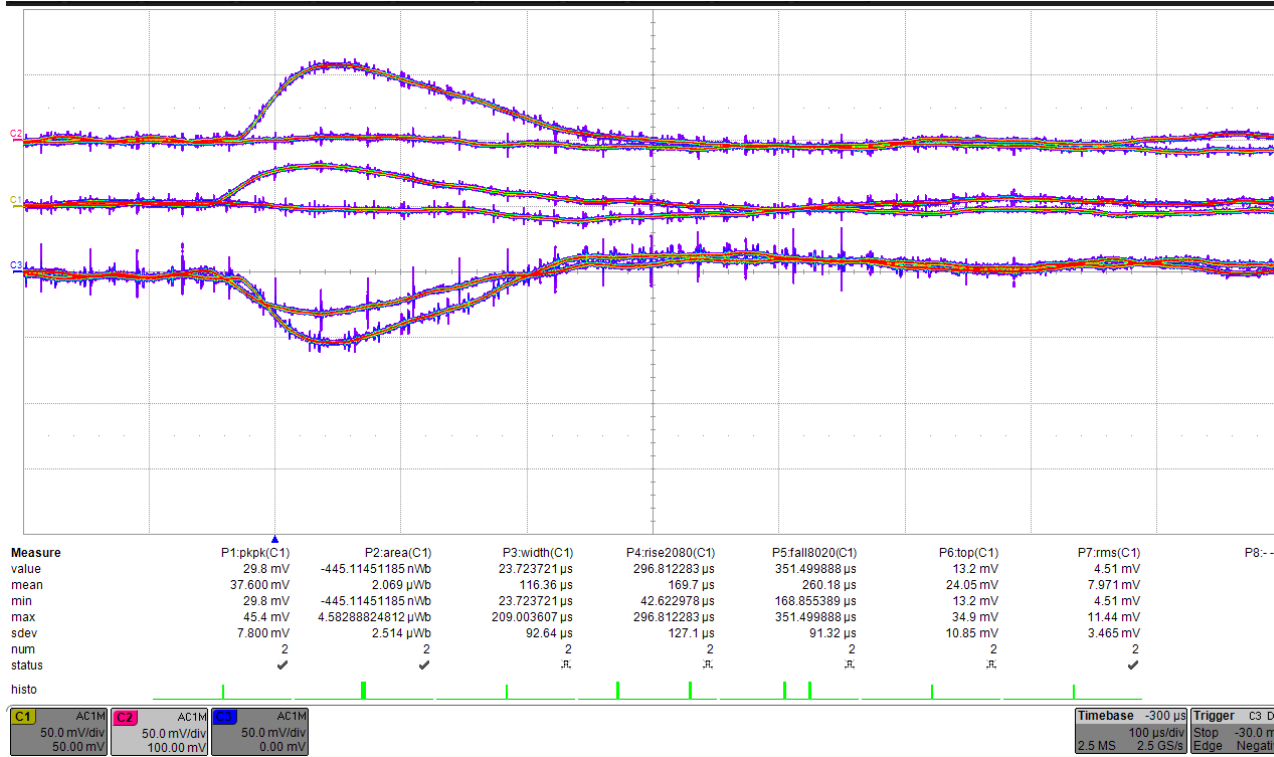
Supervisor: Michael Schmelling

Results with the partially assembled uTelescope



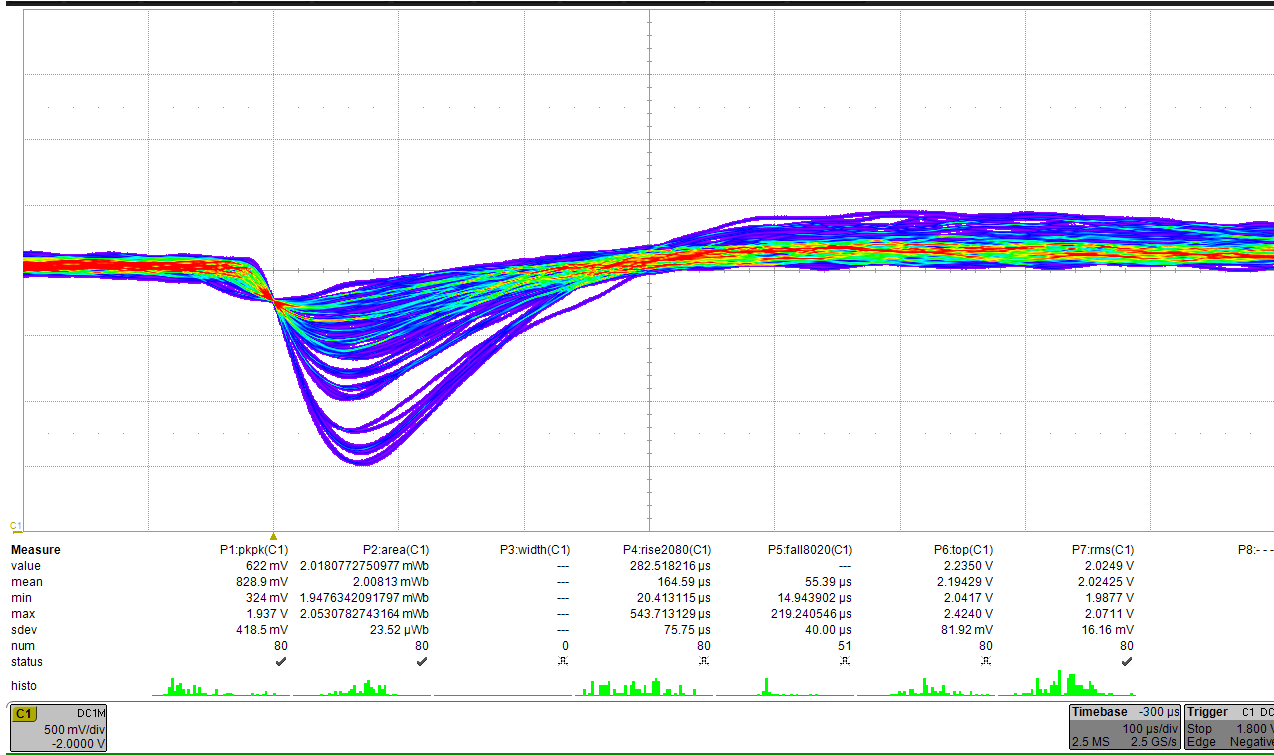
- Signal
 - Behind LM358 opamp
 - Spectrum range: 0 Hz to 1kHz
 - Horizontal div: 20db/div
- Noise peaks:
 - Multiples of 50 Hz
 - Vanishes when the PSU is not connected
 - Likely coming from the internal rectifier

Summing and amplifying signals



- Signals
 - C2: PIN-Diode with JFET and two opamps
 - C1: PIN-Diode with JFET and two opamps
 - C3: Inverting summing junction
- Triggered on -30mV at the summing junction
- Visible how peaks propagate.
- Additional noise on the summing junction, as it was not shielded.

Summing and amplifying signals

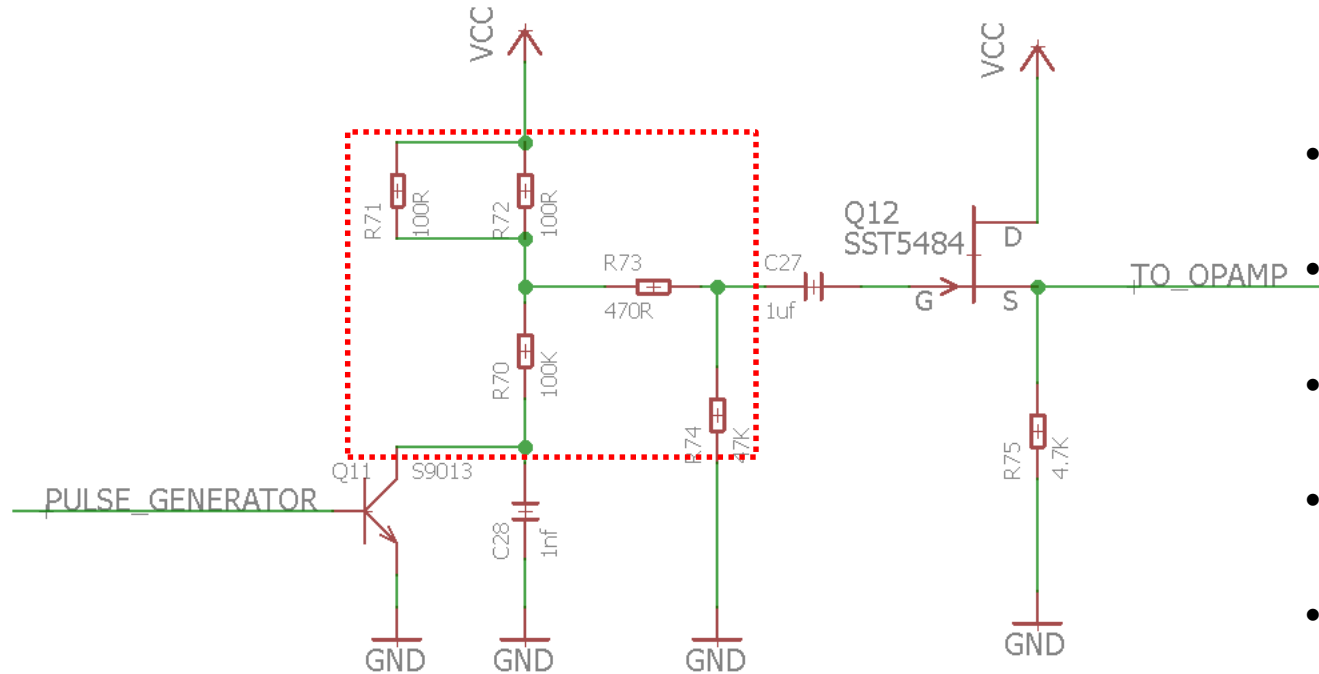


- Signals
 - C1: Inverting summing junction
- **Note:** Scope running in DC mode with 0.5V/div
- Added a x5 amplification
- Pulses are now between 0.5V and 2.5V
- Unlikely that very high peaks damage the uC as they are caught by GND
- Quiescence voltage shows the battery level

Generating test pulses

- Different approaches were tested
- Via step-function generator charging a capacitor
 - Pulse can be brought into the correct voltage regime via a voltage divider
 - Too much noise from the function generator
- Via an arbitrary function generator connected directly to the JFET
 - Easily configurable time constants of the incoming pulse
 - Voltage can be trimmed via a voltage divider
 - Still too much noise
- Discharging a capacitor via a transistor
 - Can be driven via the step-function generator
 - Time constants and voltages are configurable via potentiometers
 - Works with very good noise figures

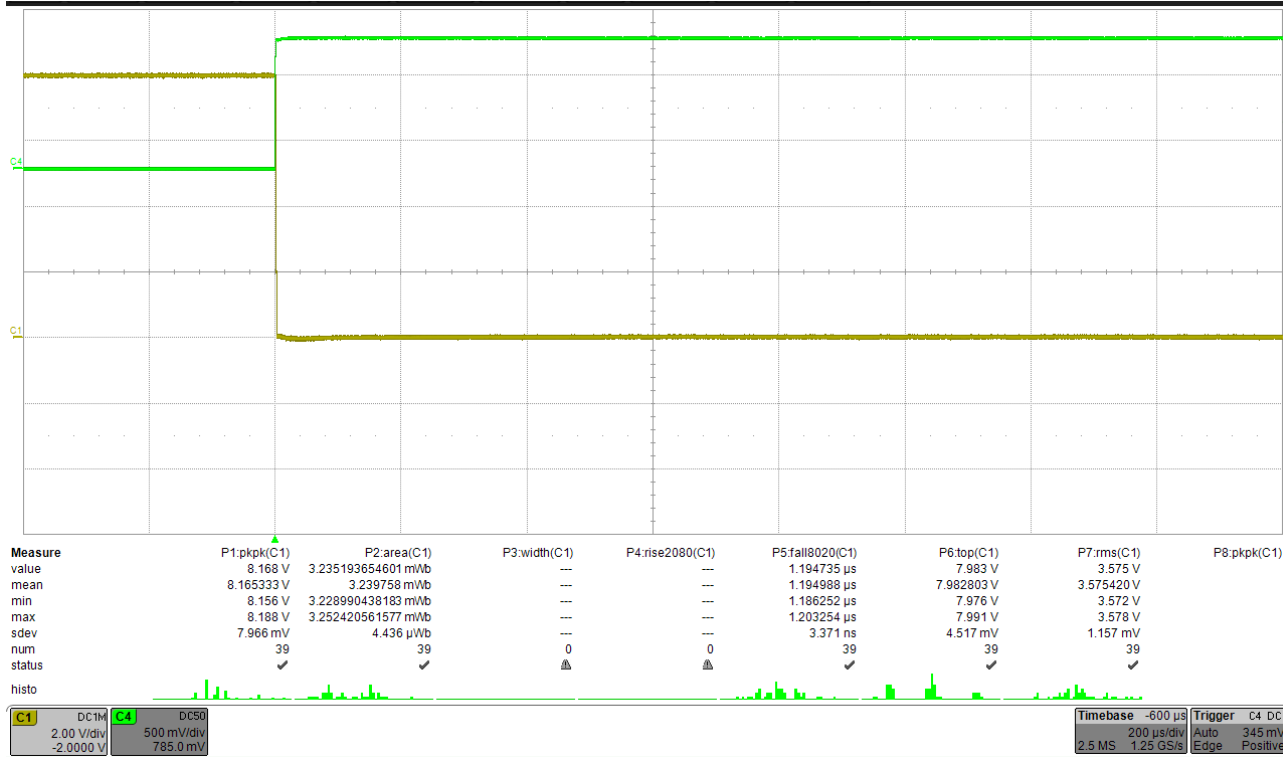
Generating test pulses



Current pulse generation circuit

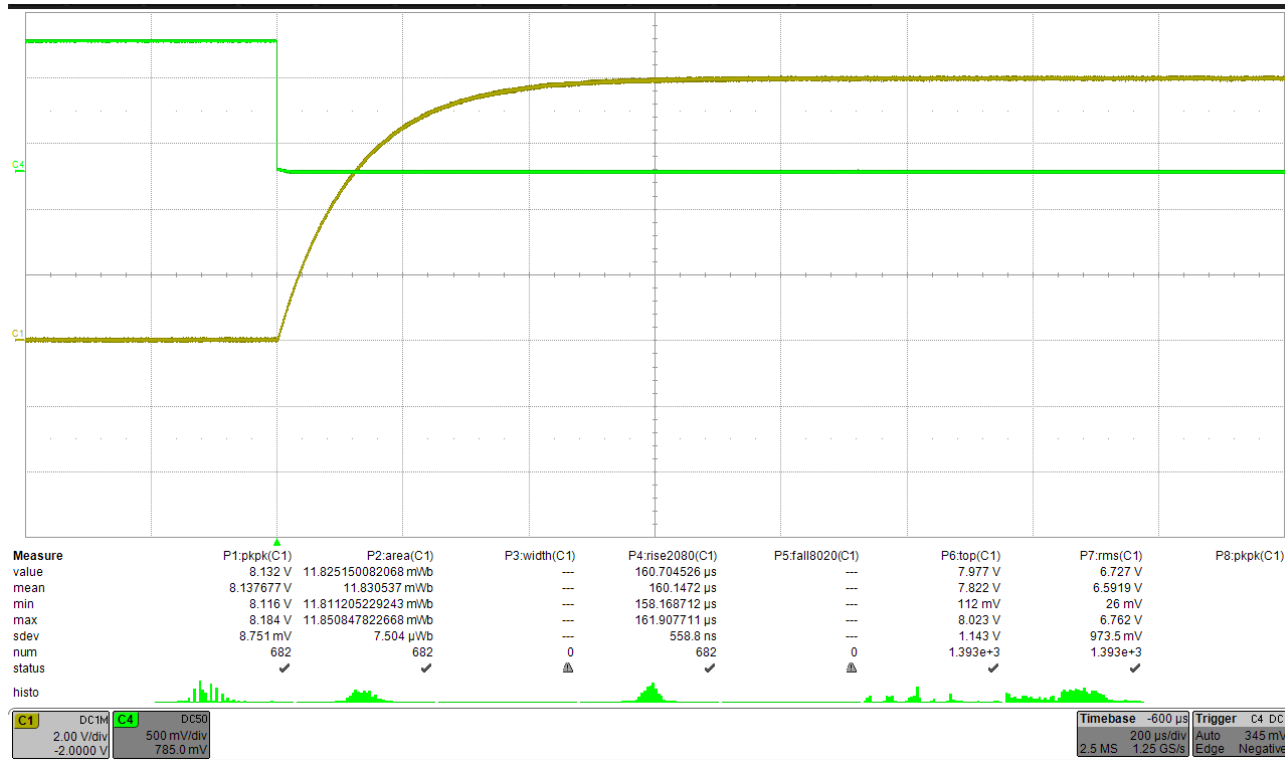
- Suggested and calculated by Michael
- Slight configurations from Hendrik
- Boxed resistors are tunable potentiometers
- Capacitor is discharged near instantly
- Then: Charges with a set time constant

Generating test pulses



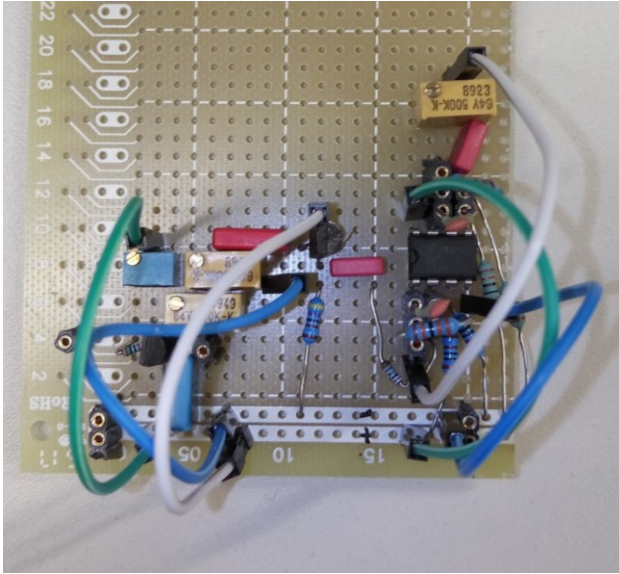
- Signals
 - C1: Voltage at the capacitor
 - C4: Step-function
- Capacitor discharges near instantly

Generating test pulses



- Signals
 - C1: Voltage at the capacitor
 - C4: Step-function
- Charging of the capacitor happens with the set time constant

Generating test pulses



Current soldered pulse generation circuit with opamp

- Breadboard had too much non negligible capacitance
 - Pulse generator coupled into the signal
 - Opamp would sometimes even work without vital capacitances plugged in
 - Characteristics would change when unplugging and reinserting components
- Pulse generator and one amplification circuit was soldered onto a board
- Most parts are still pluggable or tunable to allow easy changes to the circuit

Next steps

- Finalize dimensioning of the op-amps
 - Compare analytical simulation and results with the pulse generator
- Start with building the schematics for the V2 board
- 50% of my time working will now be spent on writing the thesis