



Detector breadboard @ UniUd

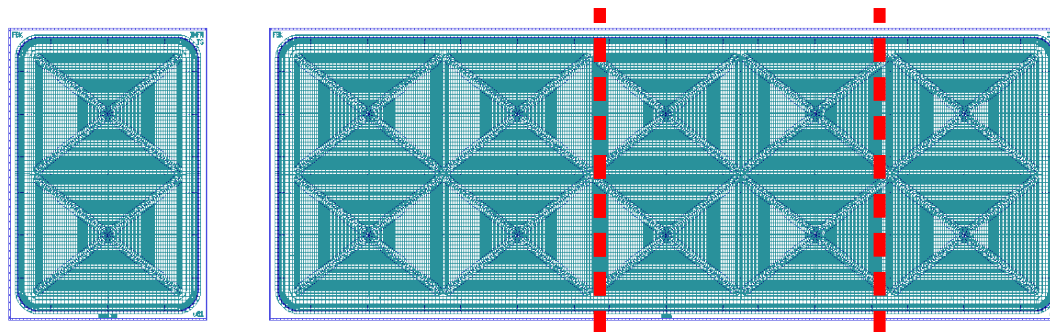
Nicola Zampa

Features

- Provides the possibility to perform X or γ ray measurements with HERMES-like sensors
- Supports both test and full versions of the sensor
- Up to four front end channels
- Simple analog signal processing
- Integrated test pulser (fixed amplitude)
- Interface to Red Pitaya

HERMES sensors

- Two channel SDD array connected to front end
- Full HERMES array with:
 - four channels connected to front end
 - four channels bundled to SMA connector
 - Two channels bundled to SMA connector

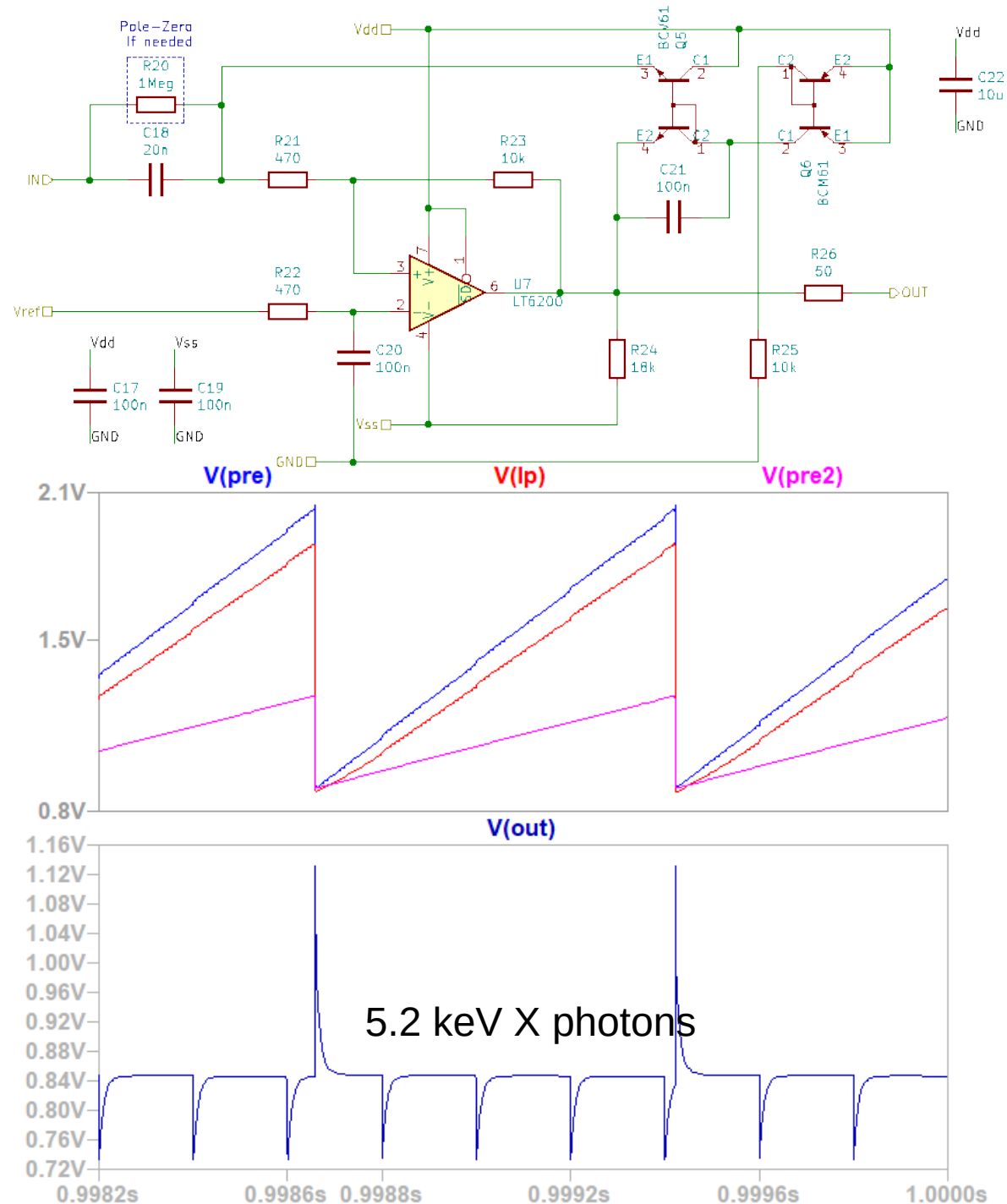


Analog signal processing

- Preamplifier: SFS3 from PoliMi
- High-pass amplifier:
 - based on LT6000
 - overall gain of -10 (with 50 Ω termination)
 - fast recover from preamplifier reset
 - output range: -1V to +1V
 - output baseline at \sim +0.85V

Amplifier

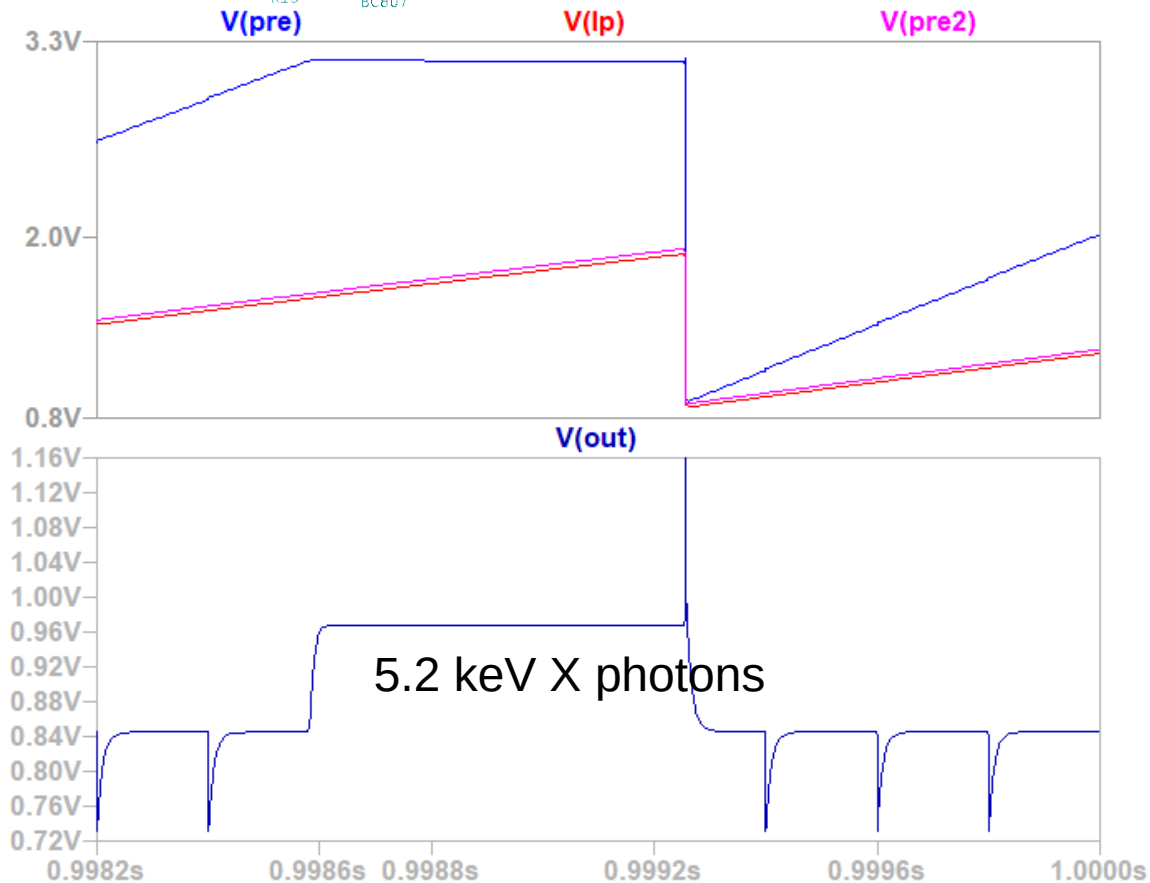
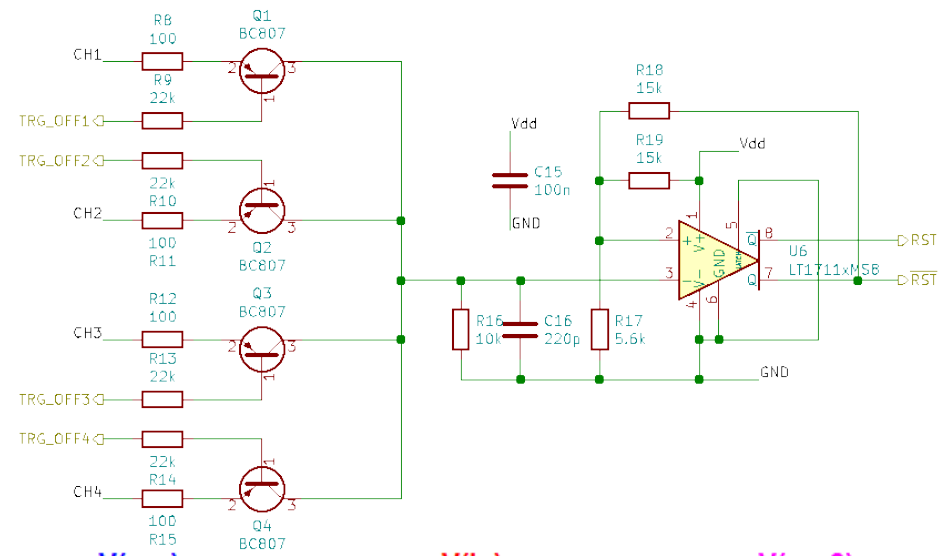
The analog signal processing circuit has been thoroughly designed to optimize its functionality, with special regard to its response to the large transient caused by the SRS3 reset



Reset

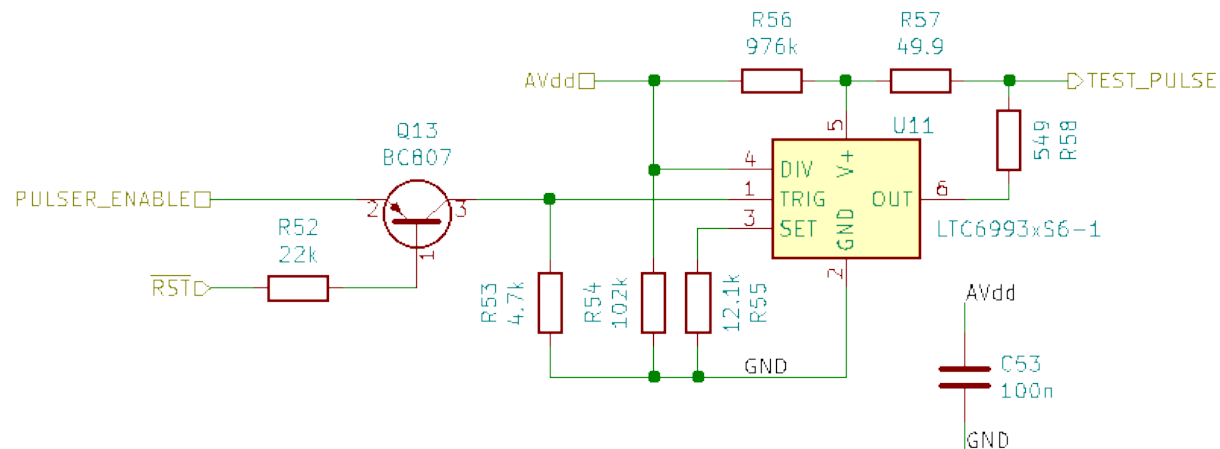
The SFS3 reset circuit samples the output of the active preamplifiers and generates a differential signal when the first one approaches saturation.

Hysteresis is employed to take advantage of most of the output dynamic range of the preamplifiers.



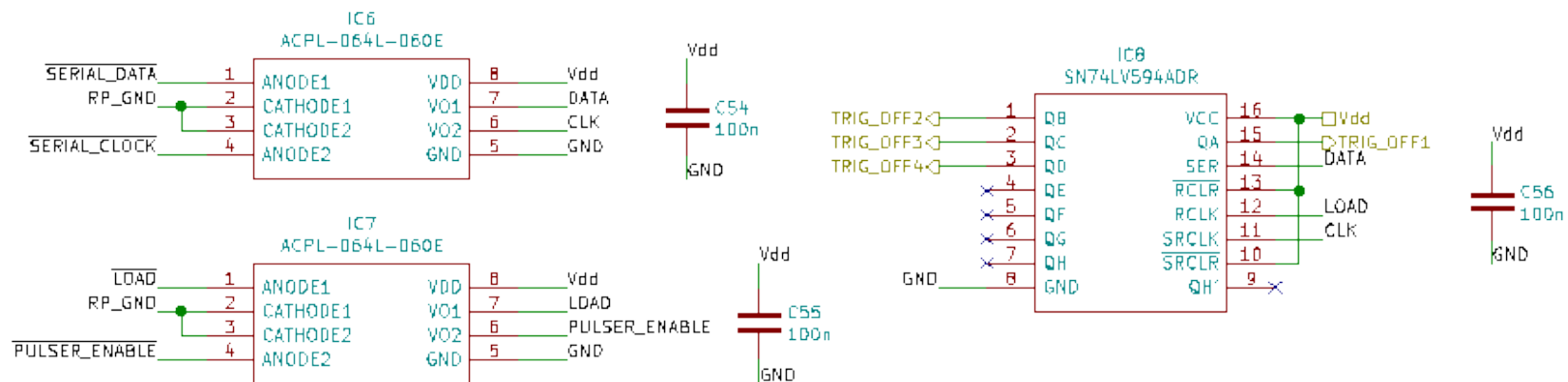
Test pulser

- A pulser integrated into the board is used to inject a test signal at a fixed time after the reset
- For test purpose only (not for calibration)
- Pulse generation is controlled by a signal masking the pulser trigger



Board control

- Channel and pulser operation are configurable
- Four control signals isolated by optocouplers
- Channels can be activated by loading a shift register with a mask
- Configuration changes after the mask is loaded



Interfaces

Analog

- Electronics power supply ($> 3.6\text{V}$, and $< -6.3\text{V}$)
- Detector power ($> -150\text{ V}$, floating wrt electronics)
- 4 SMA (amplified signals)
- 2 SMA (anode currents)

Digital

- 26 pin IDC (M), pinout compatible with the Red Pitaya extension conn. E1
- Only 4 digital signals (input to the board) and the two GND pins are used



Status

- The PCB is in the layout phase right now
- Changes to the schematics are still possible, provided the circuit would not get revolutionized