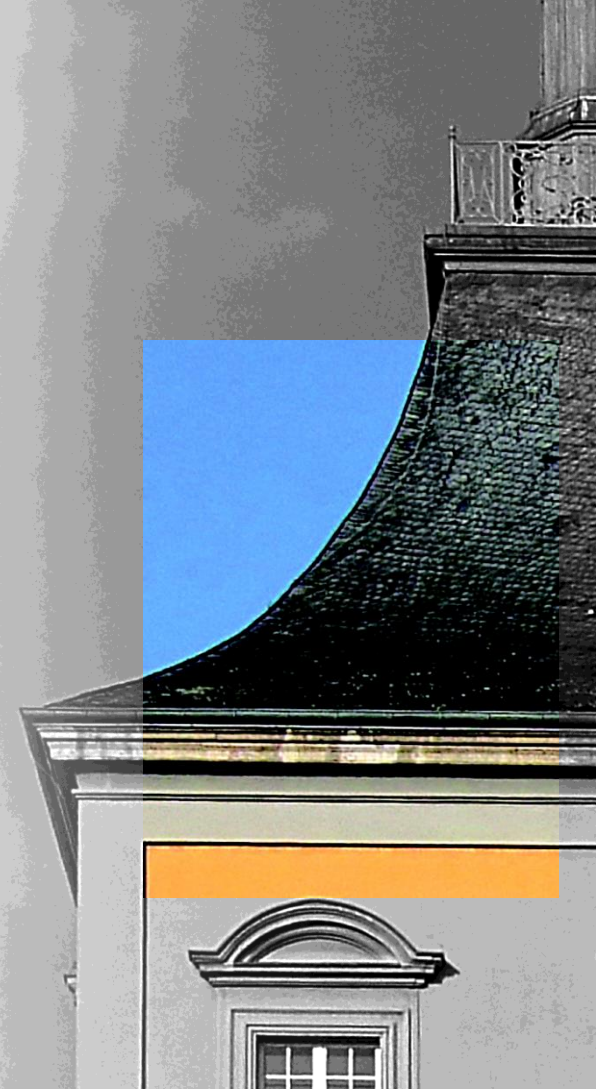


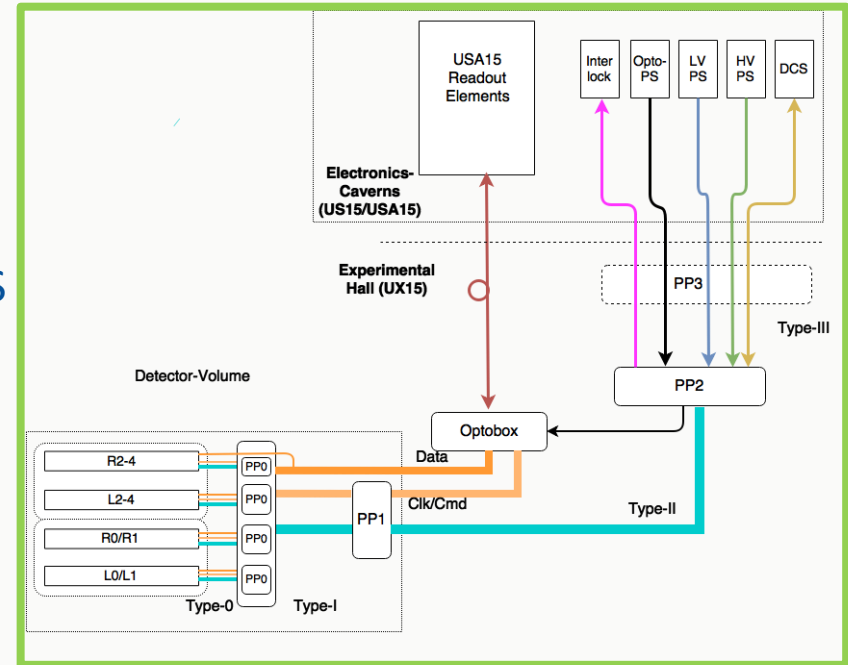
ATLAS PIXEL UPGRADE POWER SUPPLIES

Matthias Hamer, Susanne Kersten, Niklaus Lehmann, Steven Welch



GENERAL REQUIREMENTS

- we have to recycle our Type-III cables
- Power Supplies have to go to service cavern
- OPC-UA based control software
 - control of power supplies integrated in DCS
 - monitoring of individual channels
- prefer to have commercial solution:
 - high number of channels required
 - including maintenance and upgrade of PSU

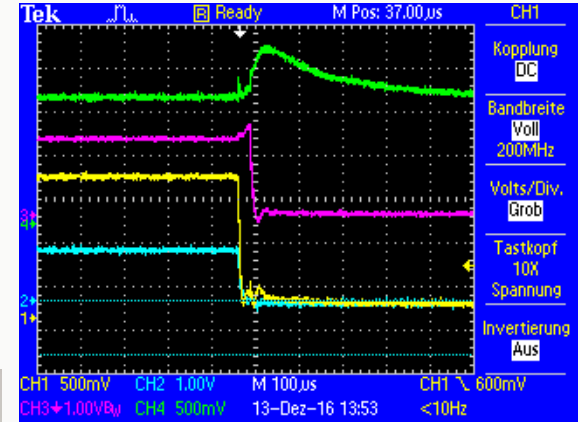


LOW VOLTAGE POWER SUPPLIES

- current source overview:
 - general:
 - individually floating channels with individual interlock signals
 - high ohmic when switched off
 - 0.4A – 10A
 - low power mode: < 2A
 - max serial current: 7A
 - ramp up: between 100 A/s and 1000 A/s (TBC)
 - measurement on high and low side
 - 5V – 50V
 - shortest SP chain: 3 – 5 modules
 - longest SP chain: 14 modules
 - losses on cables: < 4 to 6V round trip
 - allowable overvoltage: 400mV for load changes in 5-30 us

CURRENT PROTOTYPING

- prototype for ATLAS outer barrel operated with Wiener PL512 Voltage source
 - 7 FE-I4 quad-chip modules powered in series: PL512 operated at current limit
 - 2A, up to 17 V observed
- voltage source not fast enough to react to load transients (bypass activation causes chain reaction)
- development of current source add-on box in cooperation with Wiener, performance not sufficient
- next iteration of prototype being developed

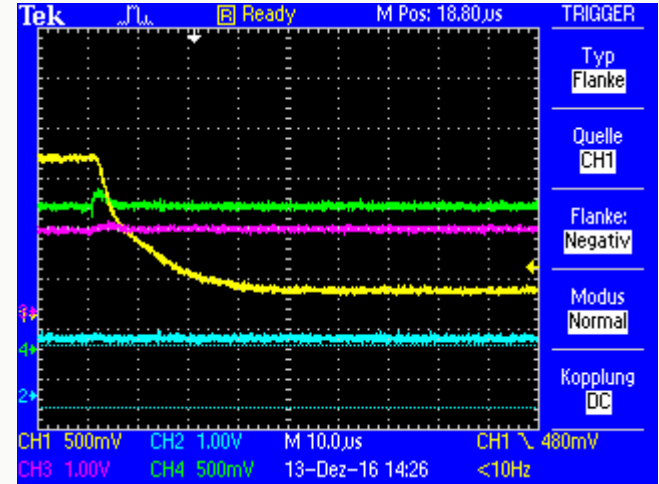
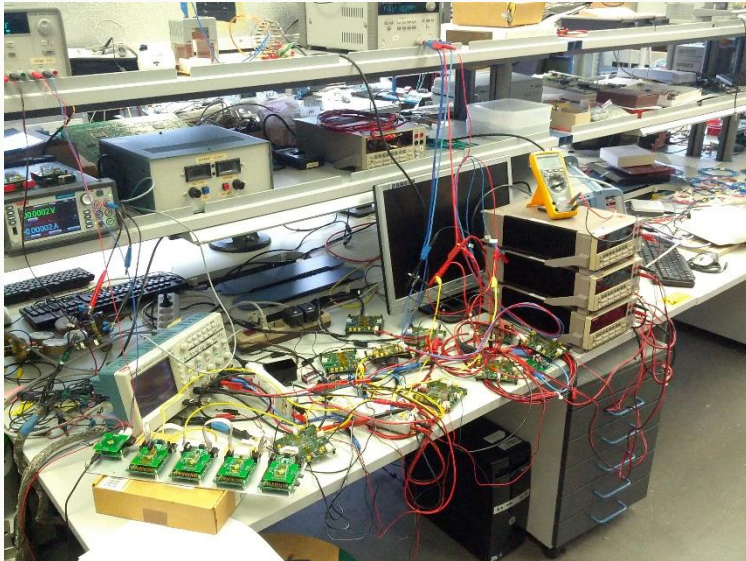


testing ongoing



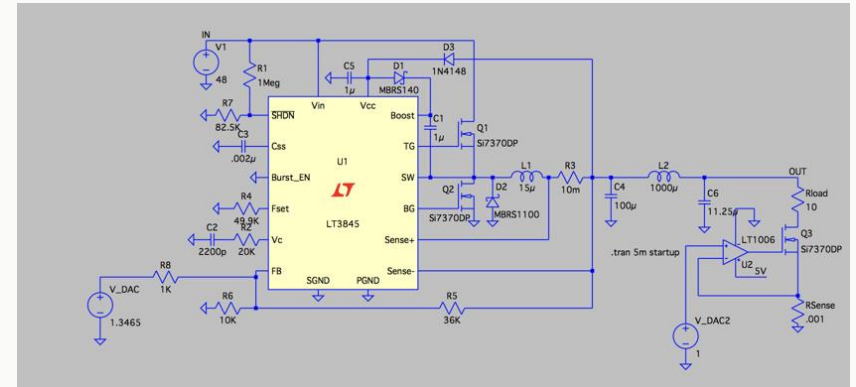
OTHER CURRENT SOURCES

- tested several different voltage and current sources in Wuppertal 2 years ago
- serial chain with SLDO prototype chips up to 8x4 regulators
- custom current source from RAL performed best – but still not sufficiently fast



CURRENT SOURCE DEVELOPMENT IN OKLAHOMA

- development of current source for serial powering at Oklahoma University
- working prototype finished earlier this year
- currently being tested with FE-I4 modules
- development of second prototype ongoing which will be distributed to several institutes

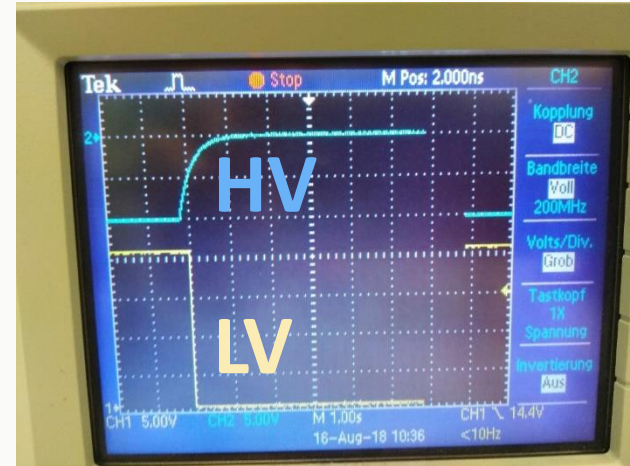
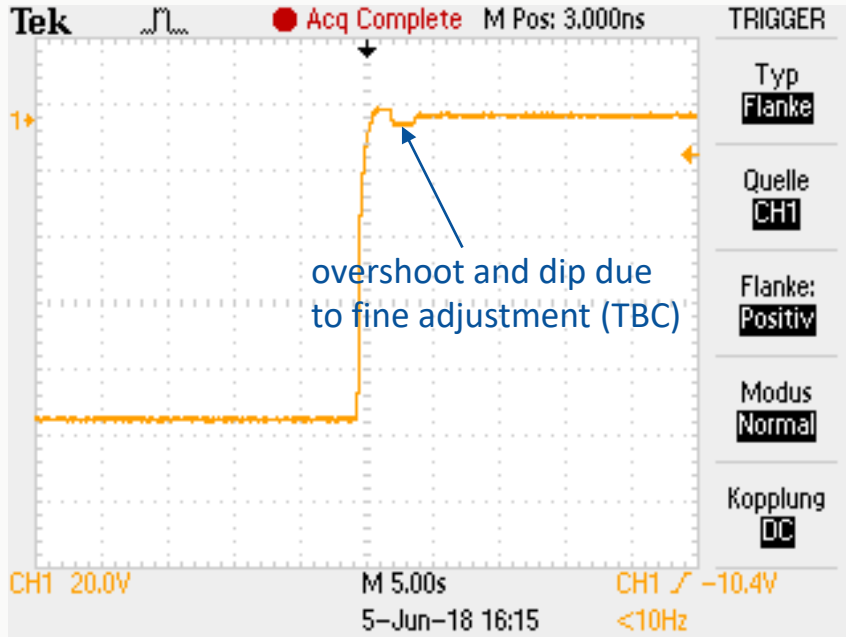


HIGH VOLTAGE POWER SUPPLIES

- requirements
 - up to 450V, 10mA (3D), 800V, 20mA (planar)
 - individually floating channels
 - ripple 5-10 mV pp
 - ideally 2 or 4 quadrant measurements: current measurement of \sim nA to mA
 - individually floating channels
 - individual interlock signals for every channel
 - fast ramp-down in case of interlock
 - possibly low-ohmic off-mode (crowbar)
 - discharge resistors?

TESTING WITH CURRENT MODULES

- testing prototype with Iseg HV power supply used in current pixels

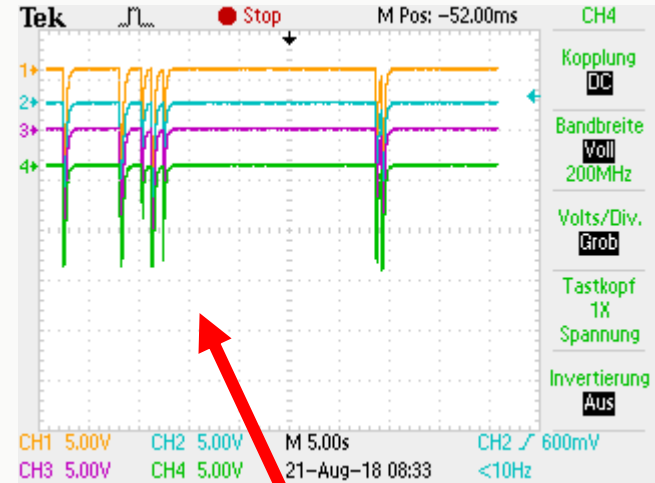
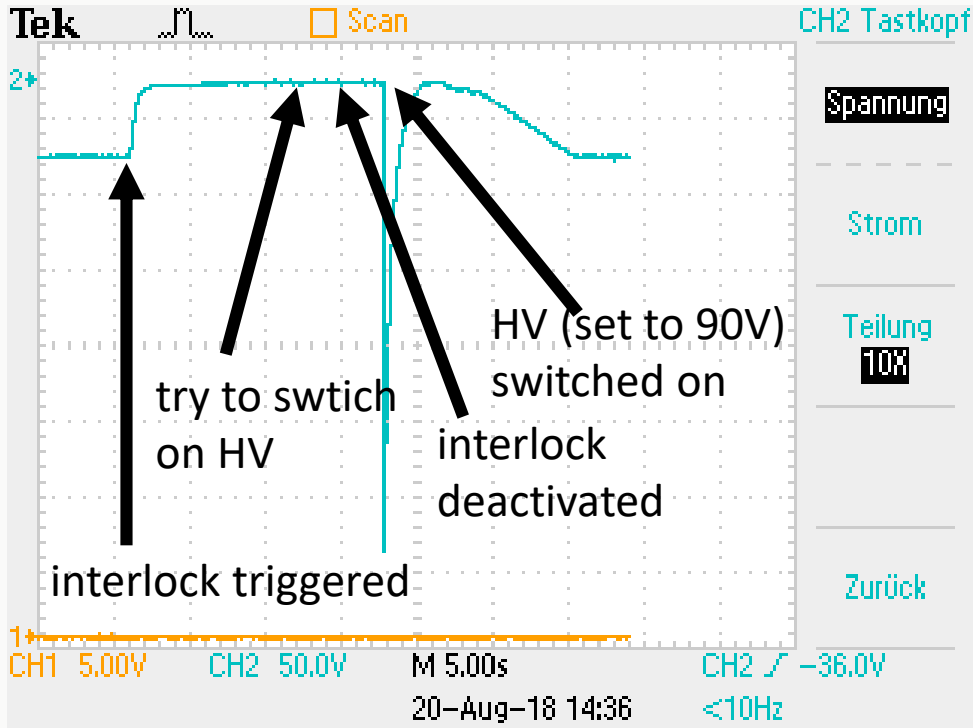


- at 90V, it takes about 5s to reach stable 0V
- might require faster ramp-down, but to be tested

interlock behaviour of current module

OBSERVED INTERLOCK BEHAVIOUR

- testing prototype with Iseg HV power supply used in current pixels



- apparently random spikes even when channels are switched OFF
- fixed by firmware

SUMMARY

- ATLAS will require about 1000 LV channels, and about 2100 HV channels
- we expect LV and HV modules with about 8 channels each
 - prototyping with Wiener for LV current sources
 - started discussing HV power supplies with Iseg
 - looking into various other options
- currently gathering information to write up specifications
 - market survey with rough specs imminent
 - refined specifications and requirements needed early next year
- ATLAS will require additional PSU for DCS and on-detector R/O components