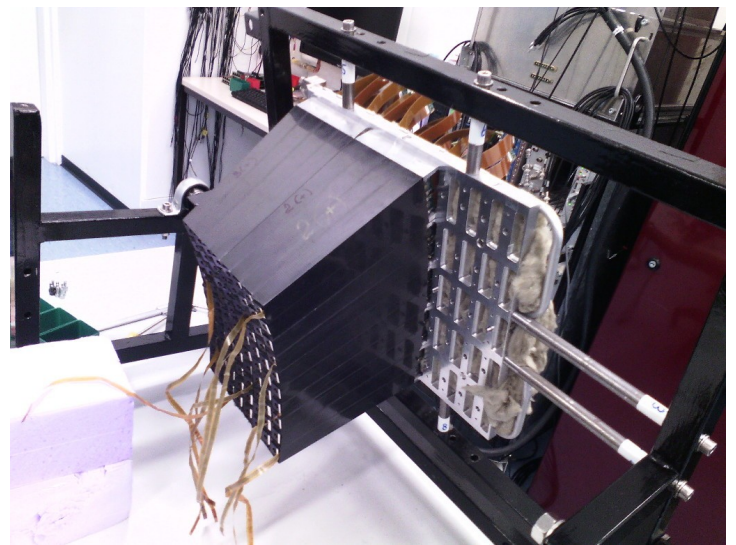
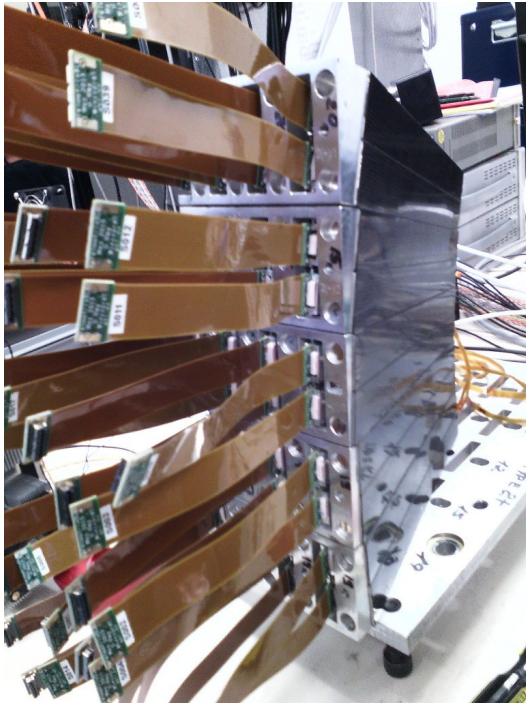
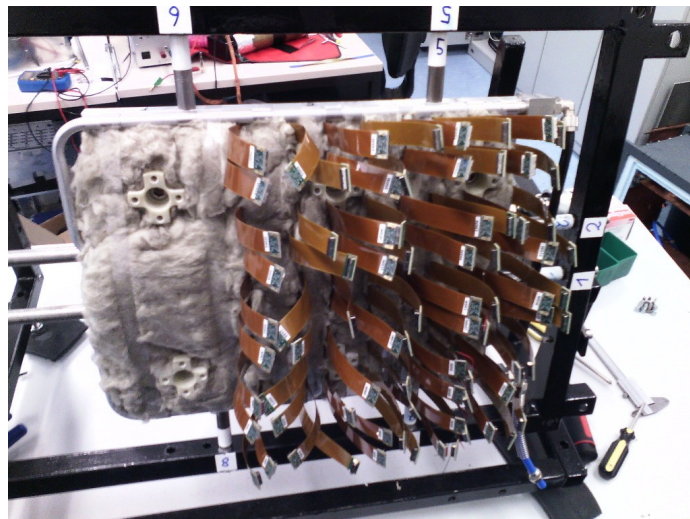


Summary on PROTO120 Beam Test in Mainz, Dec. 2015

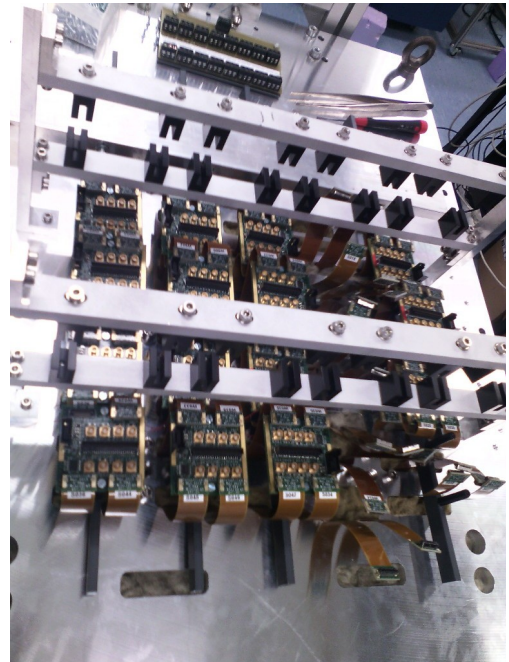
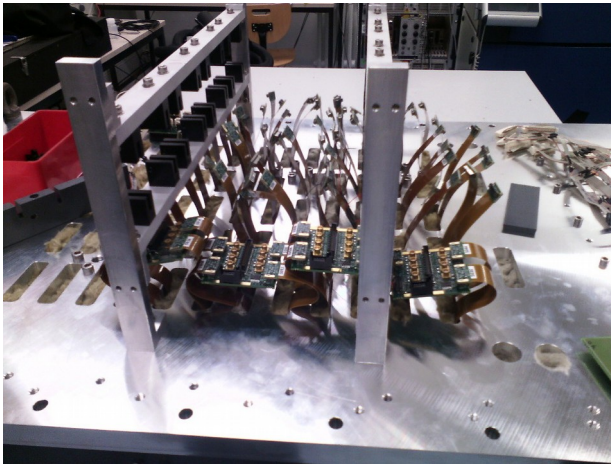
- Assembly of 2 crystal blocks (type 2 and 3)
- 80 crystals equipped with matched pairs of APDs based on information from APD database
- ASIC flex PCBs v6 with left- and right-hand connector configuration



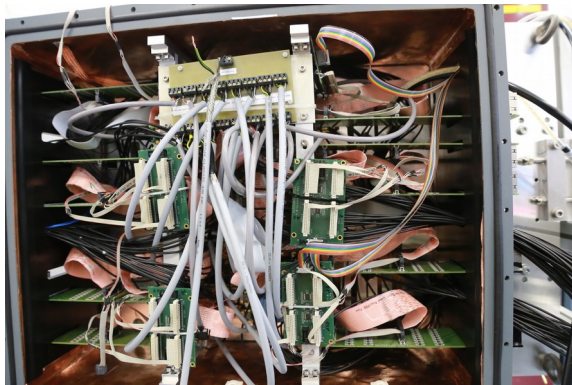
- new design of cooling plate, spacers and intermediate plate
- feed-through of ASIC cables through the warm part – now unproblematic



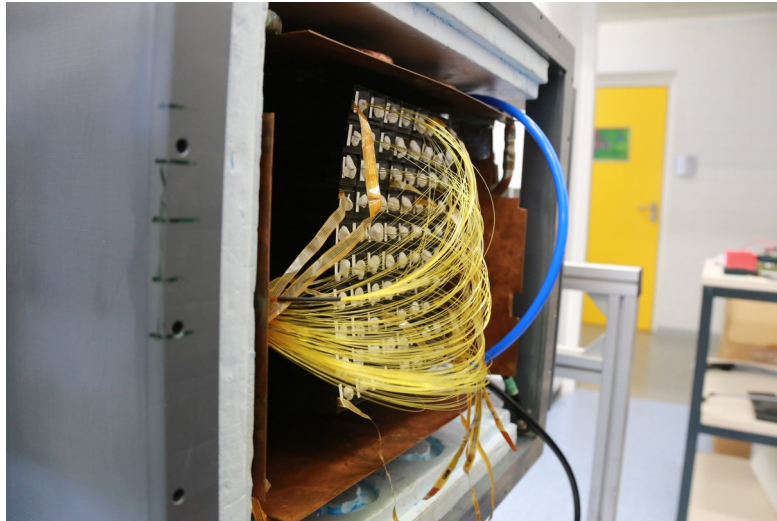
- ASIC cables still relatively stiff – problematic dense packing of backplane PCBs
- solution: staggered configuration of BPL at two different heights



- integration of remaining electronics critical: several faulty connections due to dense cabling
- contact problems mainly in ribbon cables for signals but also in new cable scheme for ASIC slow control
- conclusions: re- and new design of entire electronics from BPL PCB on (including HV distribution)

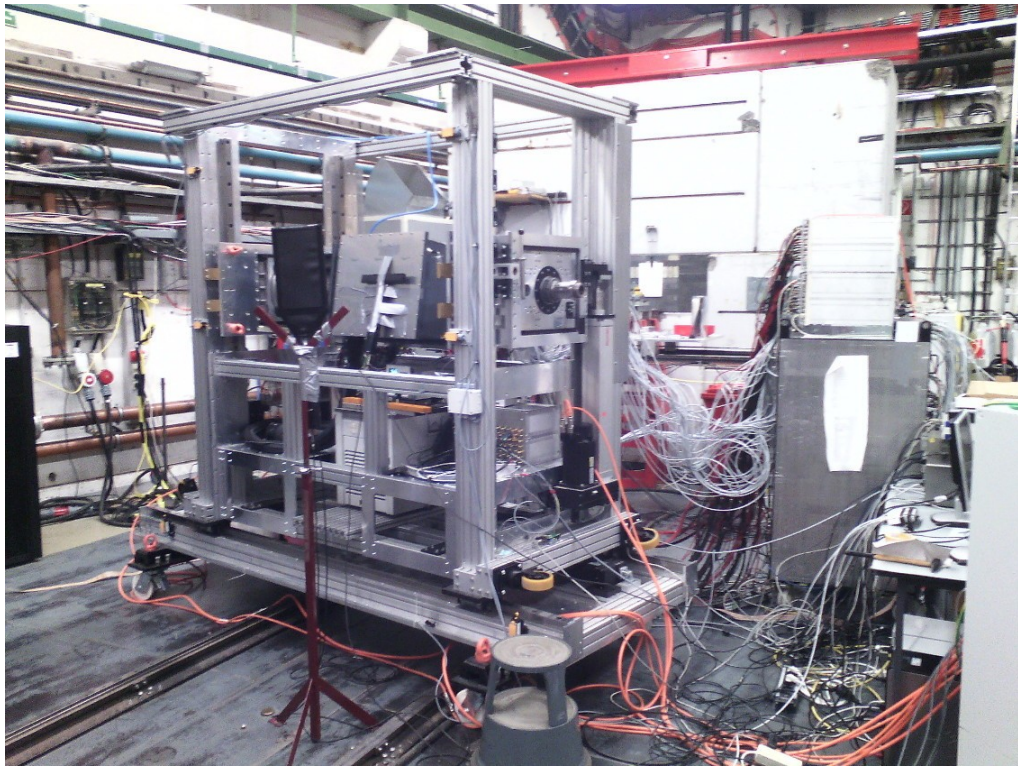


- all crystals equipped with monitoring light fibers fed into the crystal by a new (but not final) front stopper



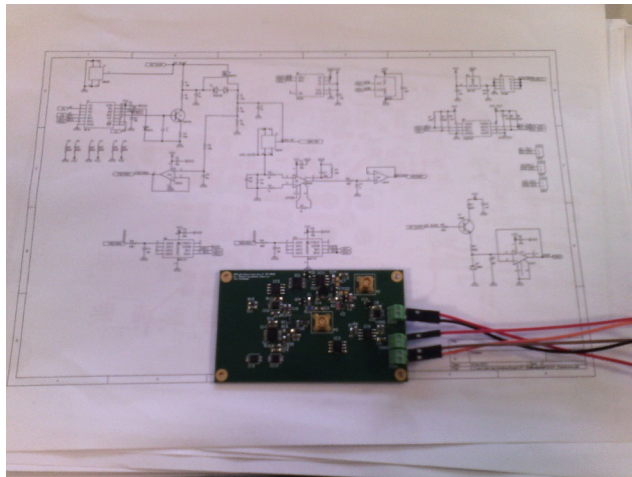
Observations during the Beam Test:

- Cooling down to -25C took significantly longer than in previous tests
- Reliability of internal signal and slow-control connections very bad. Box had to be warmed up and reopened during beam test due to connection faults
- New slow control distribution hardware (SC Multiplexer boards) not working as intended. Even with work-around (tinkered cables) no reliable configuration of ASICs performed. Slow-Control CSS definitions (OPIs) for APFEL ASICs didn't run during the beamtime on the dedicated PC (worked fine in the lab). Any other combination of APFEL OPIs with different CSS versions did not work at all.
- Only a subset of ASICs could be configured with SC. Some ASICs not addressable.
- Measurement was performed for one 5x5 matrix (depolished crystals), for which all ASICs could be configured.
- Signals could be seen online from photons and LED-pulser
- Noise higher than previous test. Estimated 10MeV threshold. But due to lack of time, no optimized grounding/shielding realized
- New low-cross-section signal cable (Bedea) tested. First look at spectra showed comparable amplitude characteristics. Only minor differences. Detailed analysis of noise and signal-to-noise pending



News from the HV Distribution Electronics:

- Proof-of-Concept prototype designed and produced in October
- Recently tested and fundamental functions verified
- Regulation of a single channel from HV(In) down to HV(In)-100V with 10bit resolution (0.1V/LSB) I2C Potentiometer
- Measurement of actual APD voltage (17mV LSB, 530V FS) and current (30pA LSB, ca. 1uA FS)
- integrated temperature sensor and aaprom for configuration values
- galvanic bus isolation
- next step: test of functionality under irradiation



Scan of HV by stepping through all potentiometer (wiper) settings:

```
#ADC1 ch 0: 25129
#ADC2 ch 0: 9368
#Voltage(1) ch 0: 3.141221 V
#Voltage(2) ch 0: 1.171036 V
#*****
#HV : 431.68 V
#Current: 249.2 nA
#*****
#RMeas: 1732.56 MOhm
#LM75 temperature: 20.5 C
#X9119 WCR 0: 0
#Wiper HV (V) I (nA) R (MOhm)
0 431.917 249.81 1729.013
1 431.826 246.16 1754.255
2 431.742 243.16 1775.572
3 431.670 240.25 1796.737
4 431.594 236.97 1821.282
5 431.501 234.24 1842.103
6 431.433 231.73 1861.829
7 431.340 228.46 1888.039
8 431.276 226.36 1905.284
9 431.166 223.01 1933.399
10 431.108 221.07 1950.115
11 430.996 218.00 1977.083
.....
1014 324.898 11.63 27928.194
1015 324.781 11.66 27848.119
1016 324.695 11.64 27904.390
1017 324.582 11.59 28003.459
1018 324.462 11.57 28038.121
1019 324.365 11.59 27991.208
1020 324.262 11.62 27911.845
1021 324.166 11.60 27935.542
1022 324.043 11.57 28014.777
1023 323.939 11.52 28109.280
```

