

# Production tests and commissioning of the Pixel Vertex Detector for Belle II

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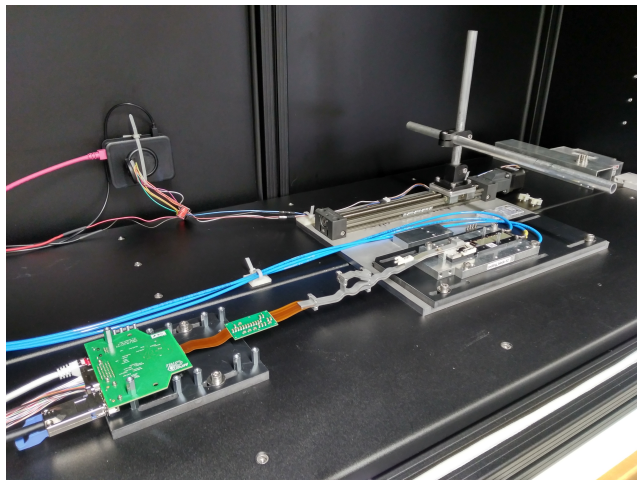
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Max-Planck-Institut für Physik  
(Werner-Heisenberg-Institut)

## PXD module test setup



## “Mass testing”



- Focus on (fast) characterization of given modules.
- 65 modules had to be tested and optimized. This was done in a collaborative effort with colleagues from the Semiconductor Laboratory in Munich and from the Universities in Bonn and Göttingen.
- 49 modules were graded as class A.



## THE PXD MASS TESTING HANDBOOK

September 13, 2018  
v0.7.1

### handbook

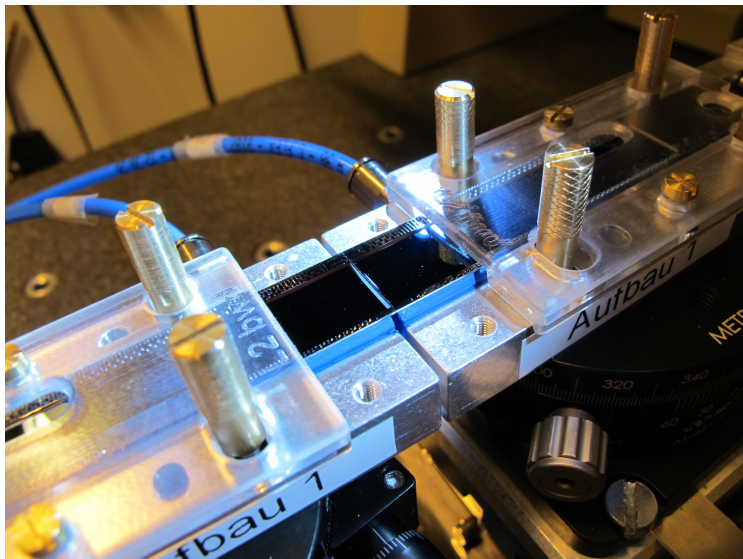
- step by step instructions for the testing
- definition of software versions used
- mechanical instructions for module handling

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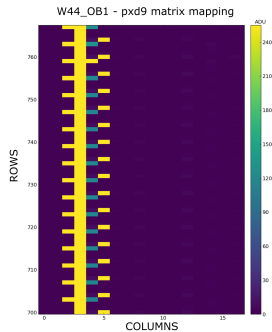
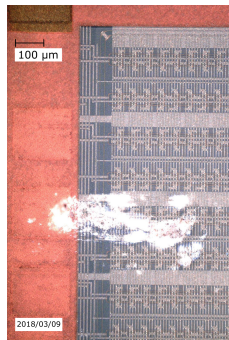
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The testing procedure of the main production modules is following the instructions of the handbook. Therefore, it is the same for each module and at each testing location.

# What could possibly go wrong when you glue?





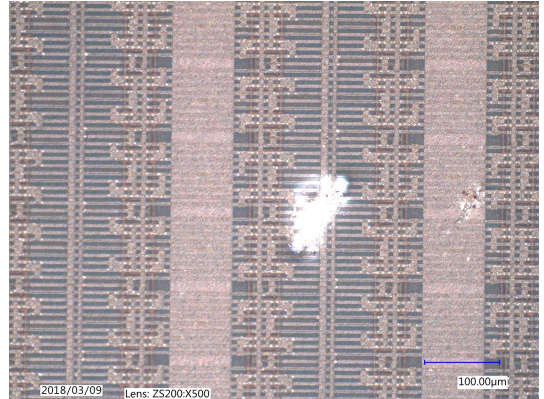


The damaged matrix of W44\_OF1 after gluing of ladder L2\_024 is shown on the left side. The bright spot is the broken BCB passivation layer. The metal lines underneath were damaged as well resulting in short-circuits. The readout of the turned off matrix on the right side shows high current in the affected drains.

## power supply

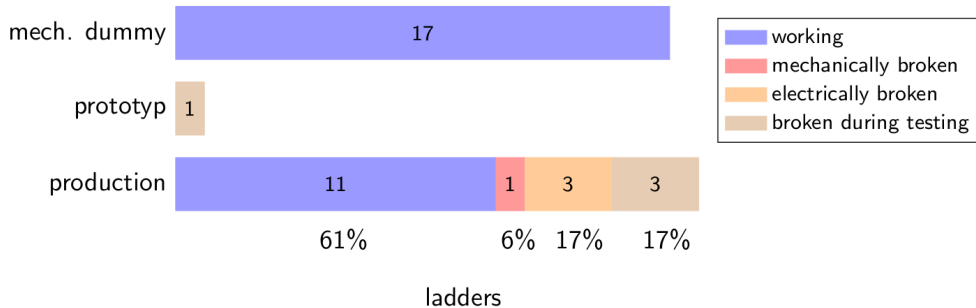
It turned out that there was in addition a problem with the ramping procedure for the supply voltages which by chance worked or damaged modules.

## Impacts in the matrices by hard dust particles (?)



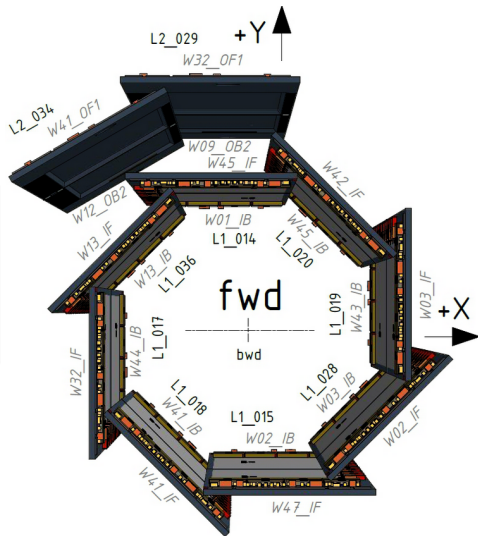
The numbers of failures summed up and it was decided to stop the gluing process in order to not risk the loss of further good modules. Only layer 1 could be completed.

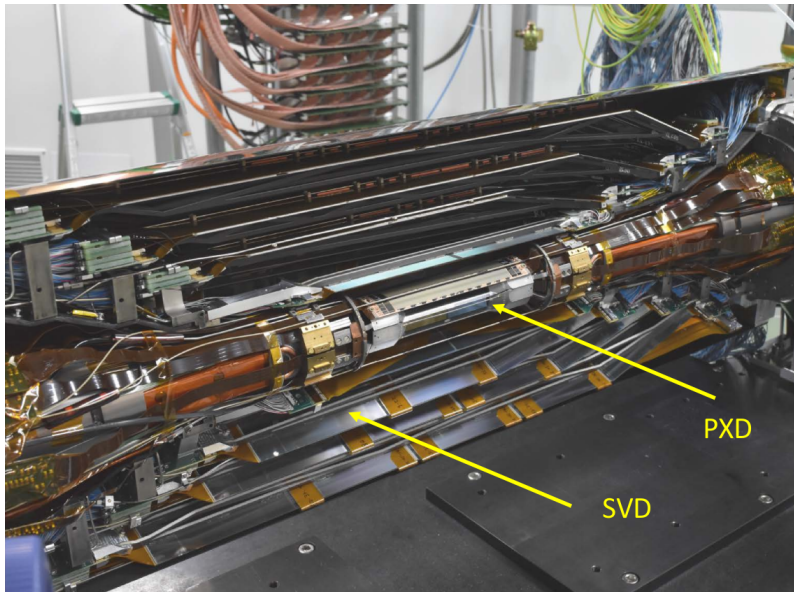




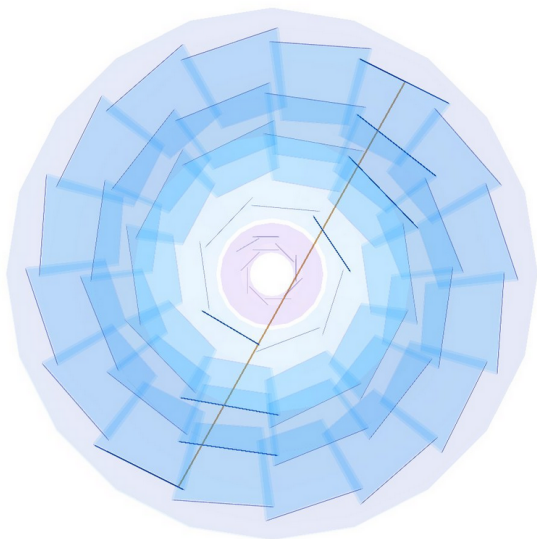
Only the “mechanically” or “electrically broken” categories are directly correlated to the gluing process. Subtracting the modules, which broke during testing, the yield of the production gluing process was at 78%.

- only half of the planned PXD could be assembled
- 20 out of 40 modules are installed
- layer 1 is complete, only two layer 2 ladders

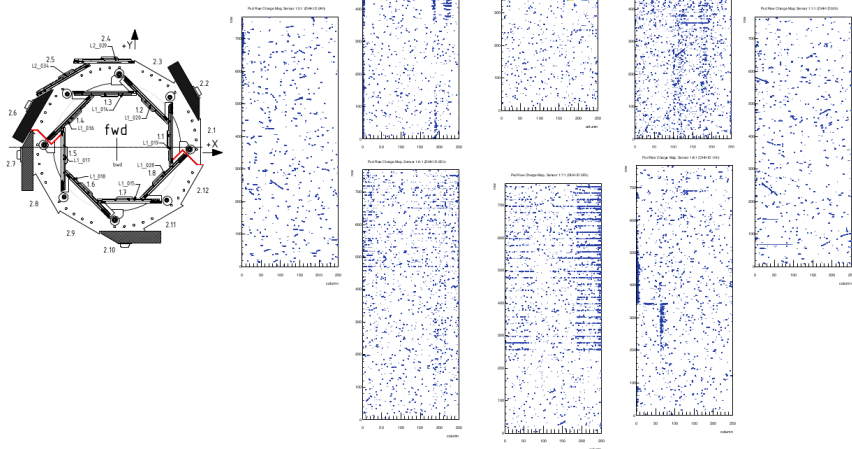




- testing the DAQ
- collecting data for alignment
- gaining operation experience



- Charge integral per pixel for  
~ 7 hours of data taking
  - ~ 500 k events
  - no masking applied



## Improvements

- modules are no longer flipped
- the sensitive area is not touched
- ceramic stiffeners are now placed from below

## Outlook PXD2020