

Update on PXD Mechanics

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13th International Workshop on DEPFET Detectors and Applications
Ringberg, June 14, 2013

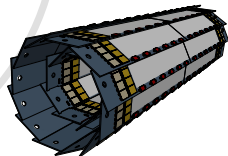


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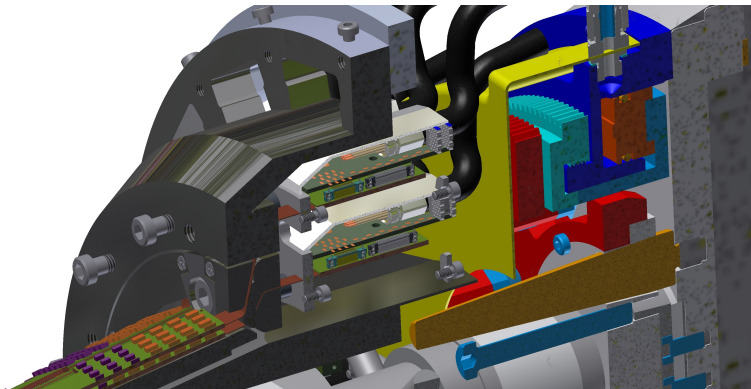


Patch Panels & Kapton Cables
Transfer Lines
Mini Fittings
PXD Support



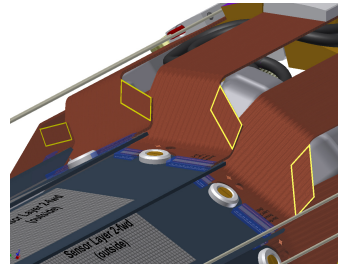
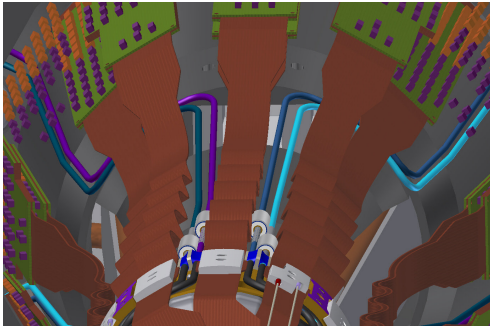
Current baseline:

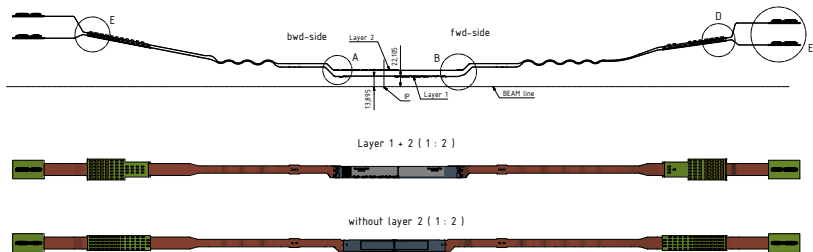
- ▶ minimal space in forward direction with automatic vacuum seal
- ▶ inset forward patch panels into BP endflange



- ▶ backwards patch panels outside of endflange
- ▶ we think we can keep length of the kapton below 50 cm on both sides

- ▶ “new” cables are in brown, old cables shown in yellow
- ▶ expansion compensation now done with waves, 500 g mm^{-1}
- ▶ larger fin to avoid microvias
- ▶ more routing friendly shape at PXD stress relief





Current cable lengths:

- ▶ 499 mm and 464 mm in fwd/bwd in layer 1
- ▶ 486 mm and 462 mm in fwd/bwd in layer 2

but still under construction target is to stay below 490 mm

- ▶ patch panel design not finalized
- ▶ Taiyo can manufacture 490 mm
- ▶ exceeding that length raises costs

Baseline for CO₂ transfer line increased from 12 mm diameter to 18 mm diameter per line

- ▶ 12 mm where not proven to work but seemed feasible
- ▶ CERN wants to use the 18 mm lines for ATLAS
- ▶ idea is to have maximum compatibility between the two systems

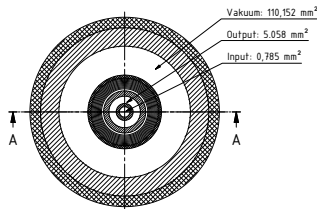
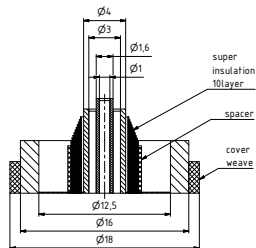
Advantage:

- ▶ lines would be more flexible

Disadvantages:

- ▶ bending radius is problematic
- ▶ service space allocation is sadly no longer sufficient is using 18 mm lines everywhere

➡ Now obtained piece of the proposed transfer lines



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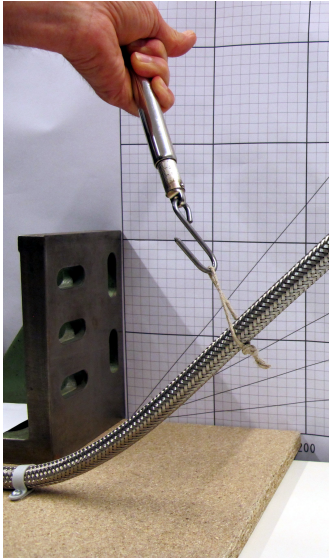
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Disadvantages:

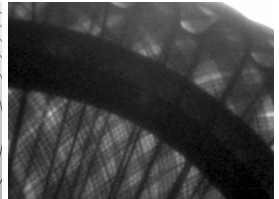
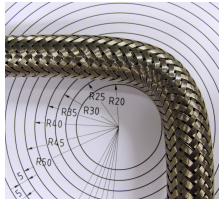
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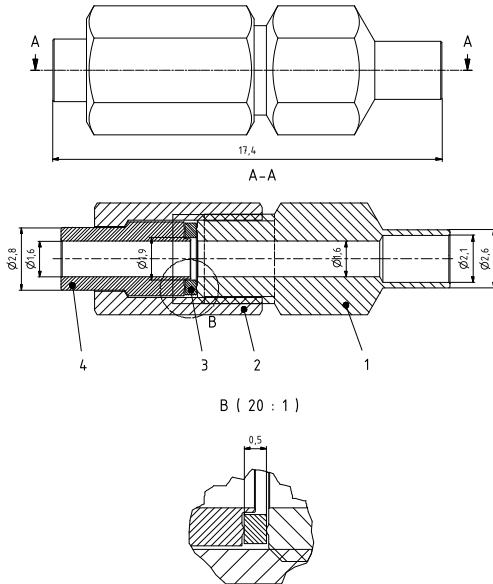




- bending by 40° (elastically) needs about 3 kg
- quoted bending radius is 45 mm
- tested down to 20 mm
- xray shows no problems even for the 20 mm bend
- we are hopeful that this is feasible but further tests needed



Small pressure/vacuum connectors

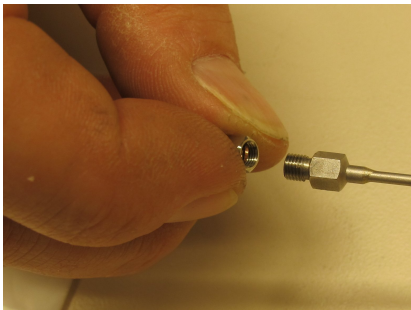


- ▶ Immanuel proposed a pipe connector with very small footprint
- ▶ We currently investigate different version of this connector to guarantee many open/close cycles

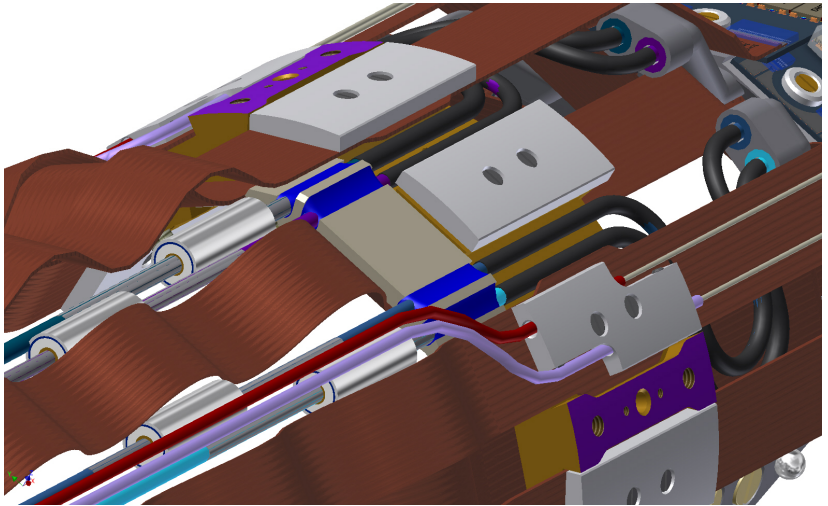
➡ Connector is for one line, we have three lines per CO₂ pipe and two per “N₂ in” line

Successful testing of Mini Fittings found by Immanuel:

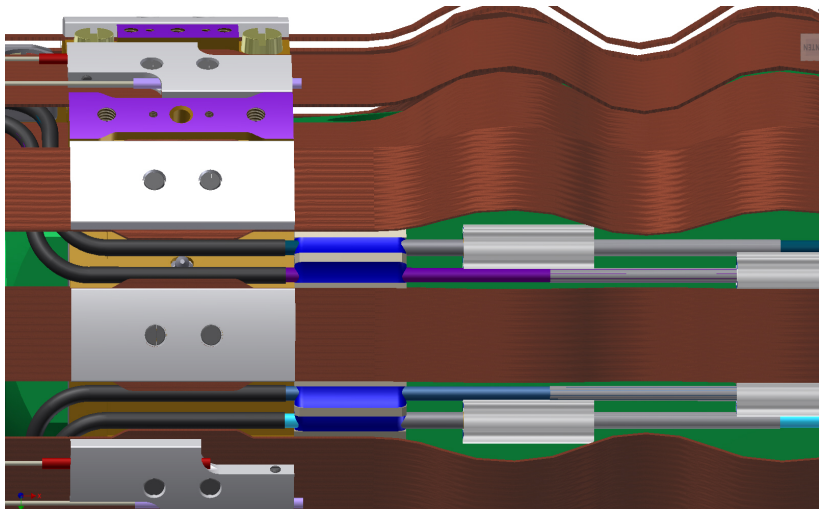
- ▶ pressure test with water (250 bar) and CO₂ (150 bar)
- ▶ tightness test with CO₂ (110 bar, 48 h)
- ▶ helium leak test at room temperature and in liquid nitrogen
- ▶ repeatability (10 open/close cycles with same gasket)



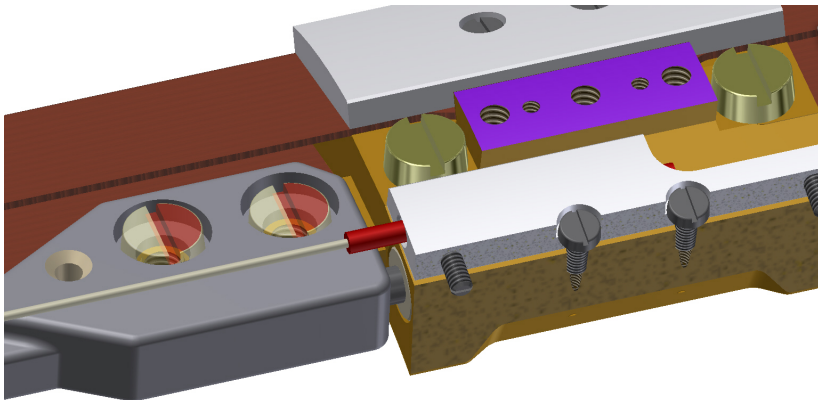
➡ No problems found, we are confident that we can use them



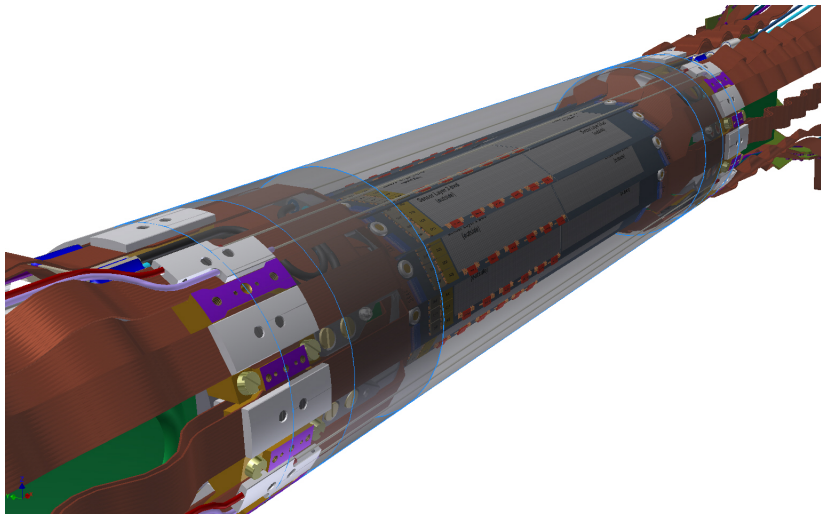
- ▶ cooling pipes have plastic support
- ▶ ceramic fitting for electrical insulation close to support
- ▶ pipes isolated between support and endflange (e.g. shrink sleeve)



- ▶ kapton stress relief now done using larger plastic pieces
- ▶ fibers routed through stress relief pieces
- ▶ stress relief for fibers using headless screw



- ▶ endflange covered in parylen (15 μm , isolation up to 60 V)
- ▶ endflange attached to PXD support using gliding pin in plastic bush
- ▶ screws changed to plastic
- ▶ screws will be removed in forward direction after installation for gliding support



- ▶ changed kapton stress reliefs make it easier to attach mylar cover if needed
- ▶ outside the acceptance a thick 100 μm foil could be used
- ▶ a very thin foil could be used in the acceptance by gluing it to the outer part

➡ Lots of detail work going on at the moment

Kapton cables:

- ▶ optimized the geometrical size where possible to avoid microvias and simplify routing
- ▶ hopeful to get total length below 490 mm

Transfer lines:


- ▶ new transferline design quite flexible
- ▶ bending radius of 20 mm seems to be feasible

Mini fittings:

- ▶ tested pressure, tightness and leakage
- ▶ no problems found

PXD Support:

- ▶ implemented electrical isolation of PXD endflange
- ▶ redesigned stress relief to simplify fiber routing and mylar covering



Thank you
for your attention