TG5:

Status of Infrastructure on Top of Vessel

Jens Schubert, MPI Munich

Overview

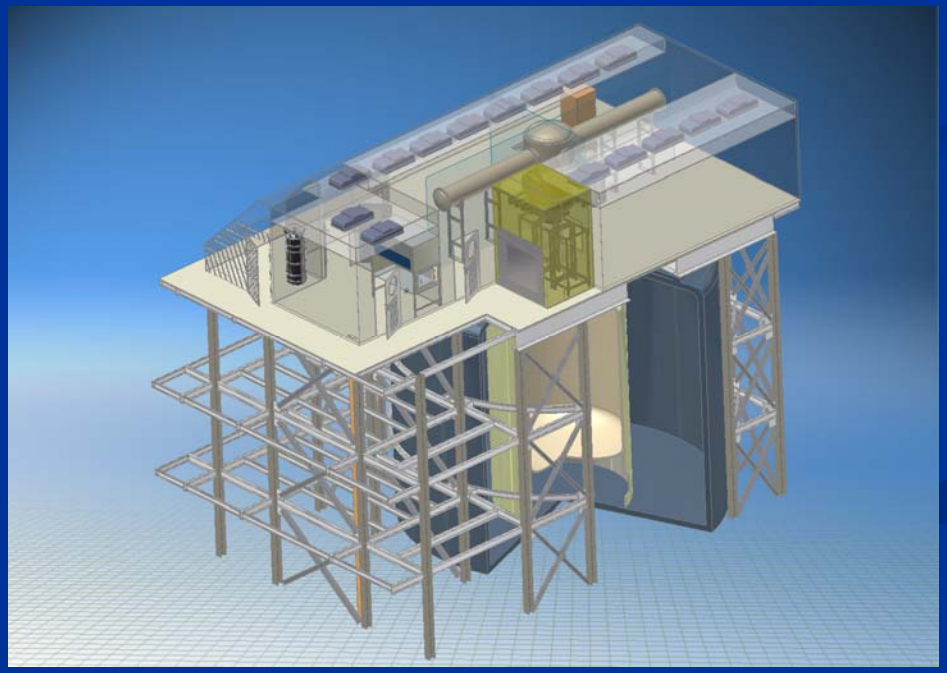
- Clean room
- String pulley
  - How to suppress rotation of string
- Rail system
  - Recently performed tests
- Pogo pins
  - Long time test, cross talk , HV tests
- Conclusion

Clean Room - Status

- Tendering process for production and construction of clean room has started!

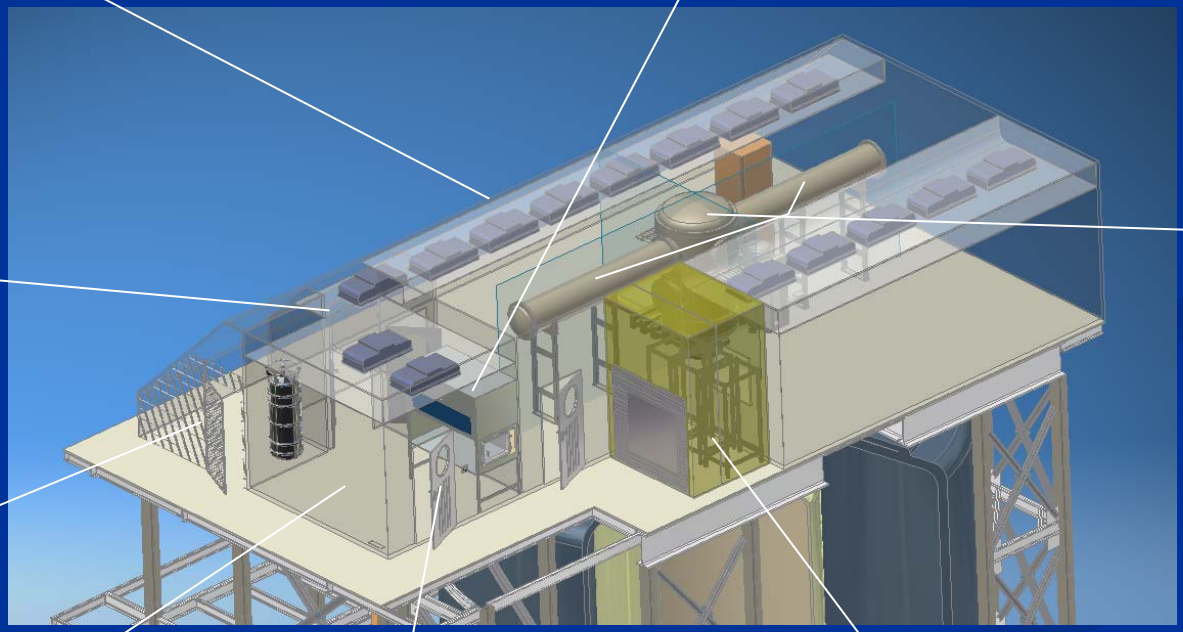
- All requirements and details are summarized in a document (Pflichtenheft) created by Franz Stelzer

- Currently: process is supervised to the construction department of the general management of the MPI

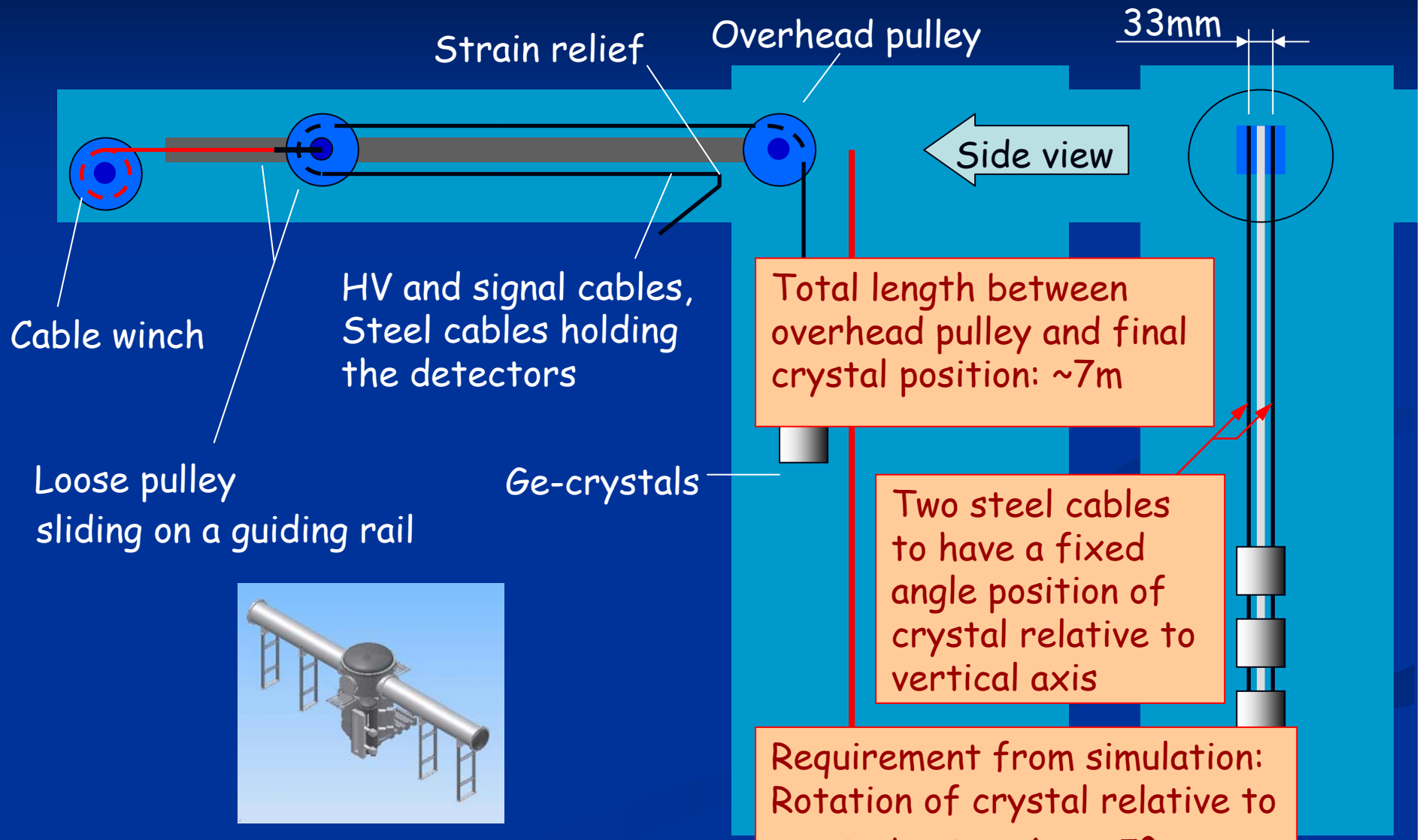


Clean Room - Structure

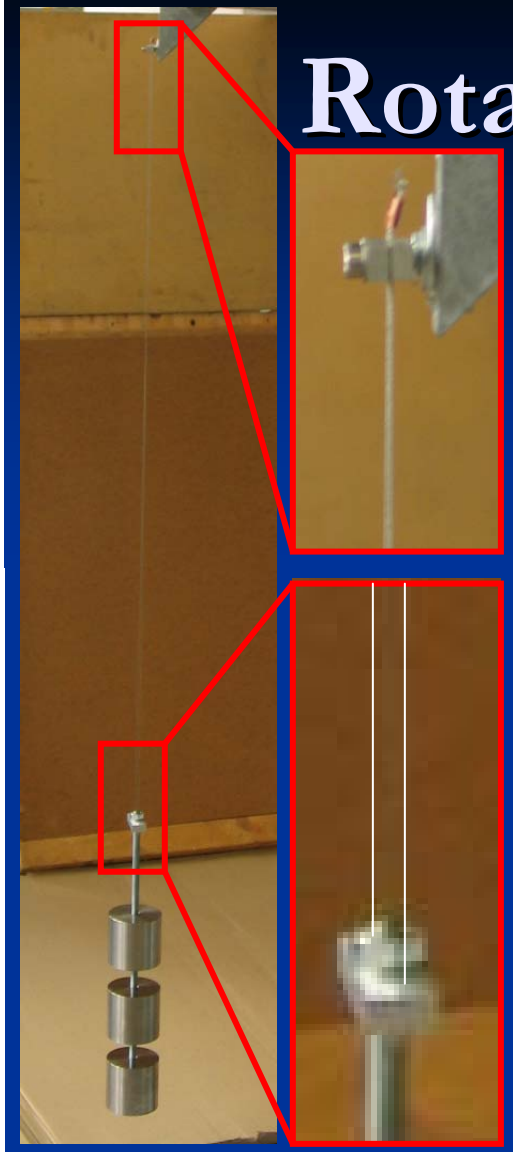
Design is driven by requirement that clean room is Radon-tight!



Reminder: String Pulley



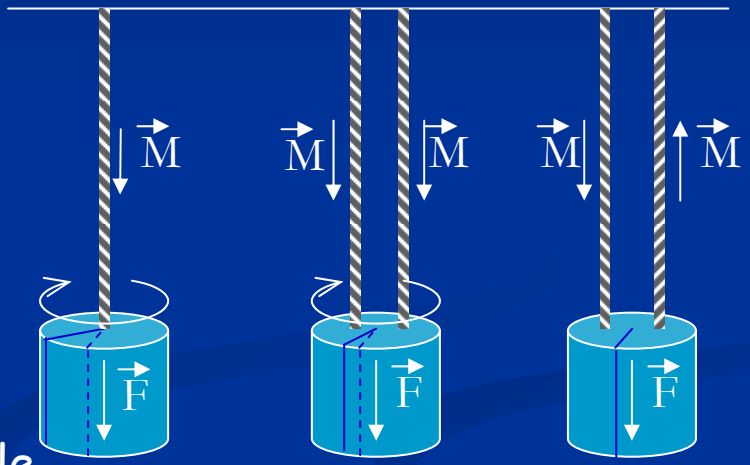
Rotated Position of Strings



… but even with two holding cables:
rotation of detector at string end

Source of rotation: Cables are wound.

- weight at cable end tries to un-wind it → Rotated position
- weight → torque M



- same with two cables, smaller rotation.

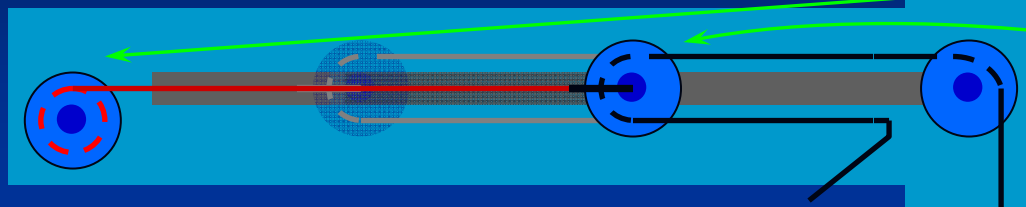
- left- and right-wound cable → no rotation

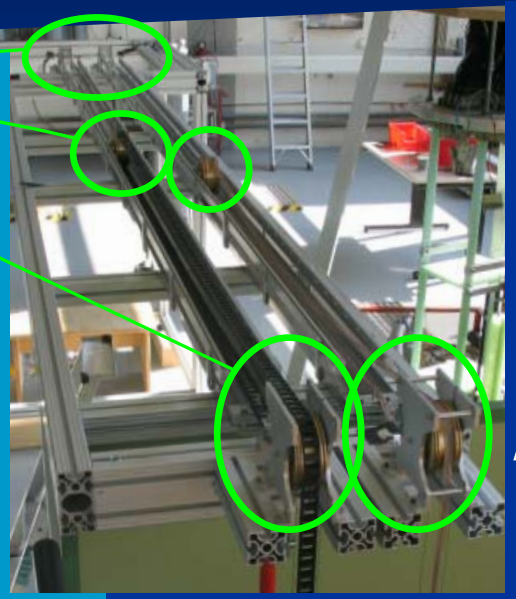
1.)Holding steel cables: Don't cause rotation !!

2.)Signal and HV cables: - could still cause rotation
- ordinary flat ribbon cable → rotation

Suppression of String Rotation

String pulley test stand at MPI Munich





How to bring signal and HV cables down?

➢ Phase I: 3 non-segmented detectors/string

- shielded teflon cable
- very loose guidance (loosely bound bunch)
- teflon = soft material
  → minimal torque
- 12 cables:

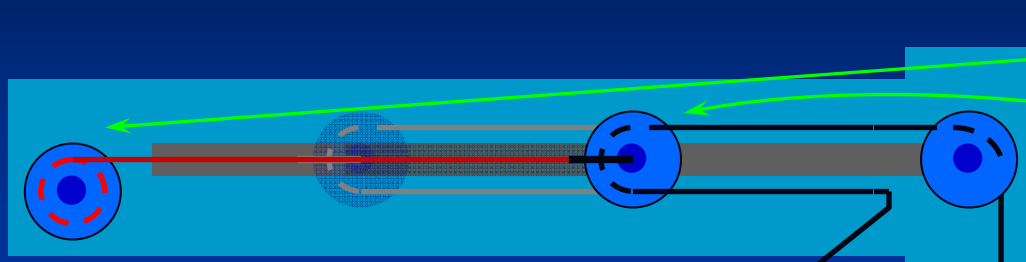
→ angle difference betwee w/ and w/o teflon cables: ~16°

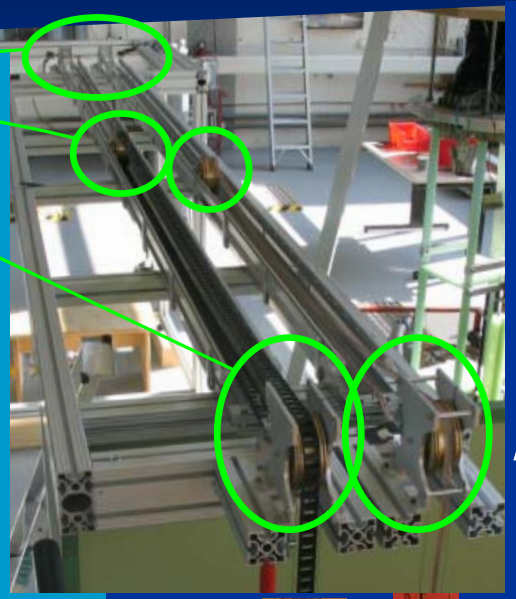
~4m

→ Teflon cable = possible solution for phase I

Suppression of String Rotation

String pulley test stand at MPI Munich





How to bring signal and HV cables down?

- Phase I: shielded teflon cables
- Phase II: 5 segmented detectors/string

a) Cables transmitting "no" torque:

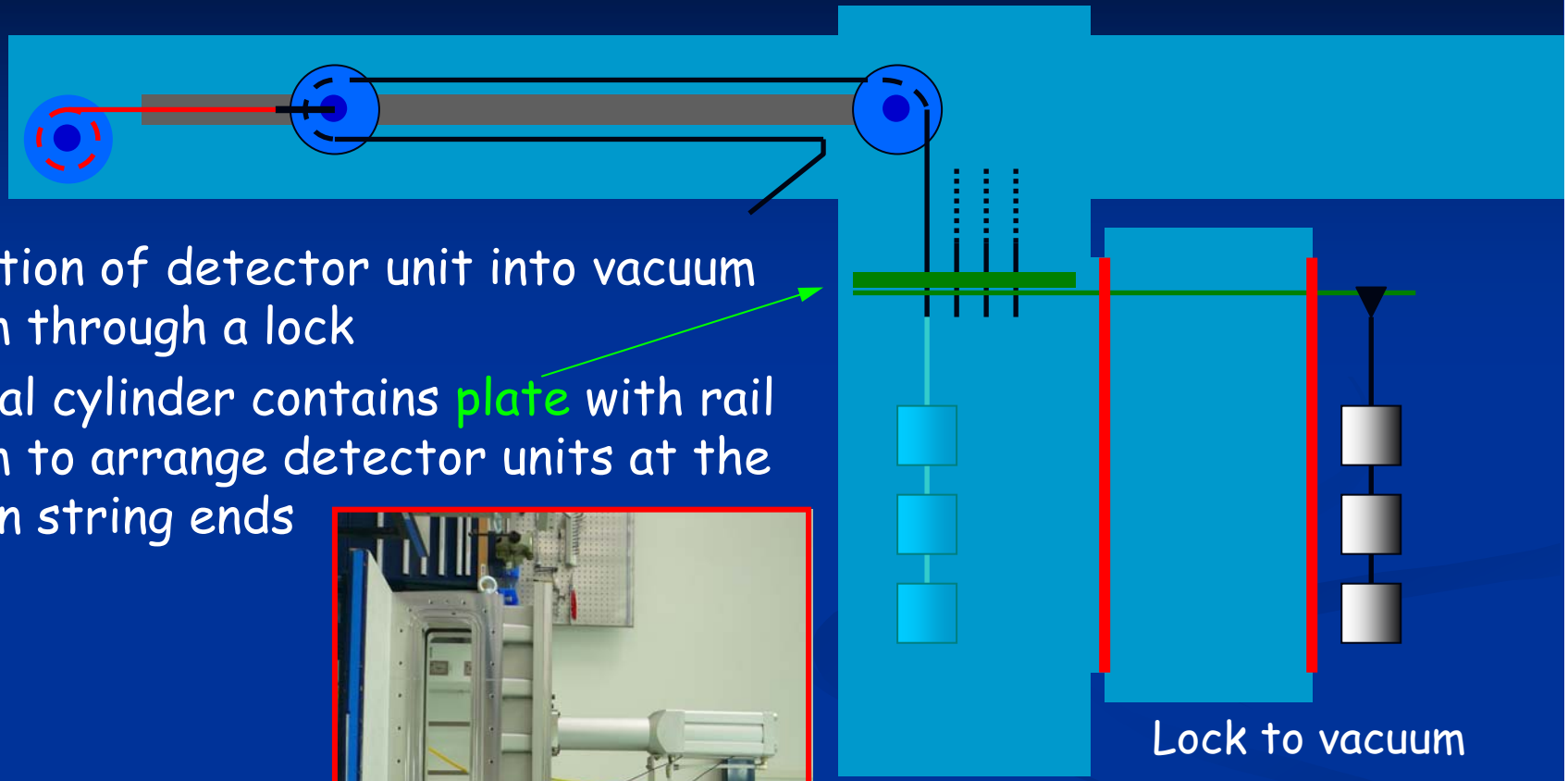
- CREST-like cables: woven cable band
- many channels with little material
- minimal torque

b) Suppression of torque

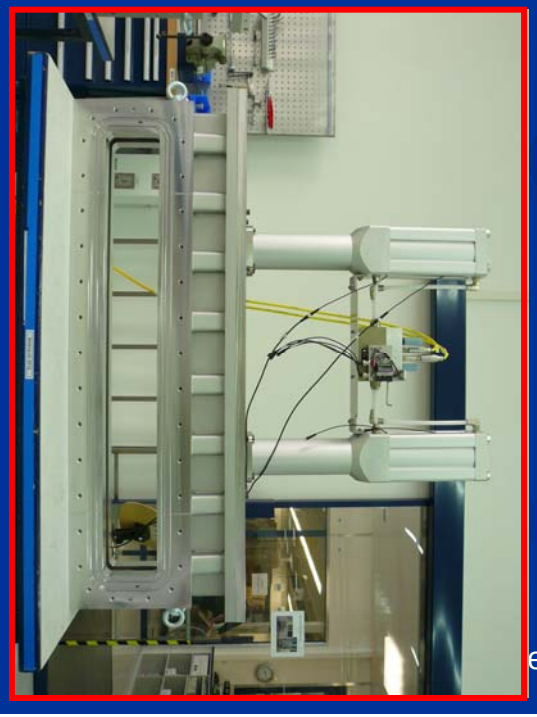
- Cables are guided in a torsion-resistant tube
- much material → chain must end ~50cm above detector

~4m

Reminder: Rail System

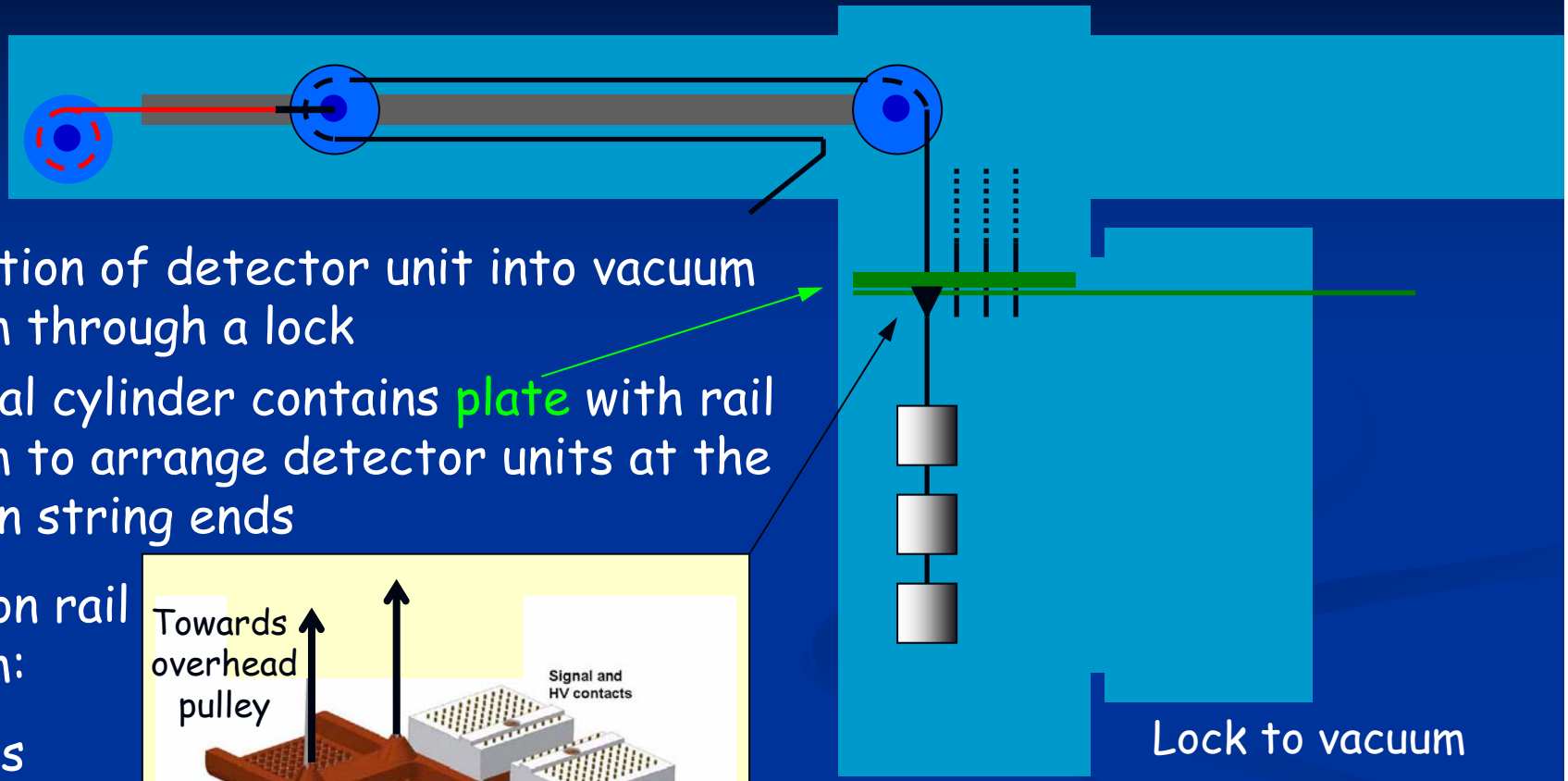


- Insertion of detector unit into vacuum system through a lock
- Central cylinder contains plate with rail system to arrange detector units at the 19 open string ends

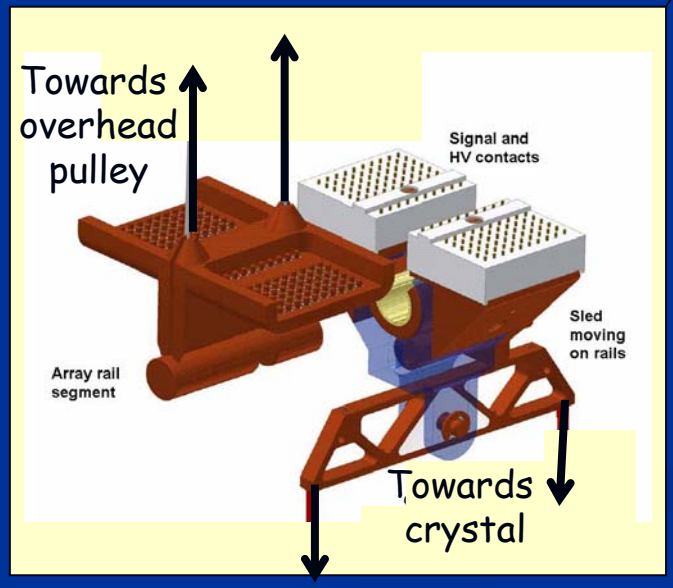


- Rectangular shutters are produced and leak-proof

Reminder: Rail System

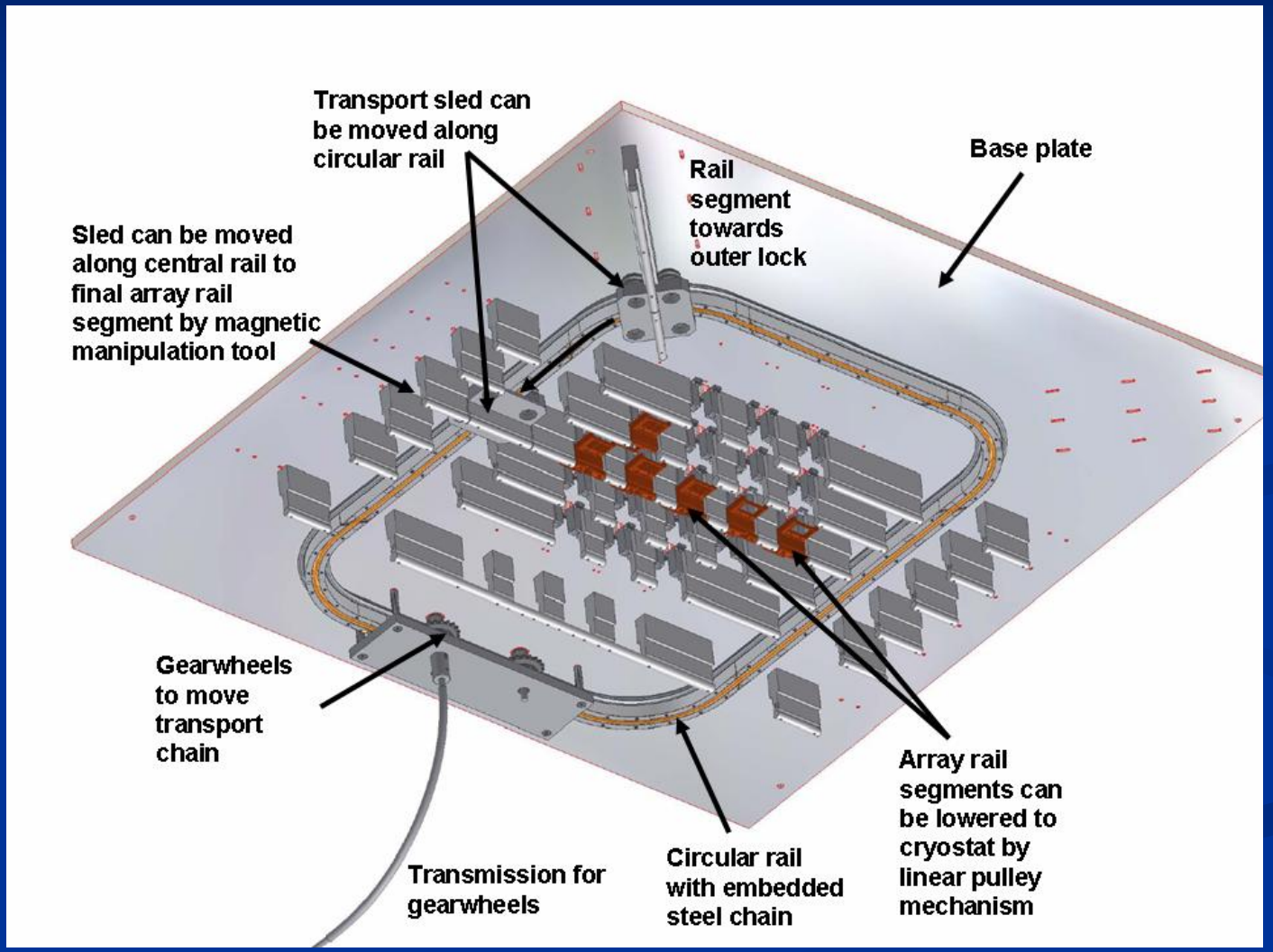


- Insertion of detector unit into vacuum system through a lock
- Central cylinder contains plate with rail system to arrange detector units at the 19 open string ends
- Sled on rail system:
- Sled is shifted by magnet arms on its rail



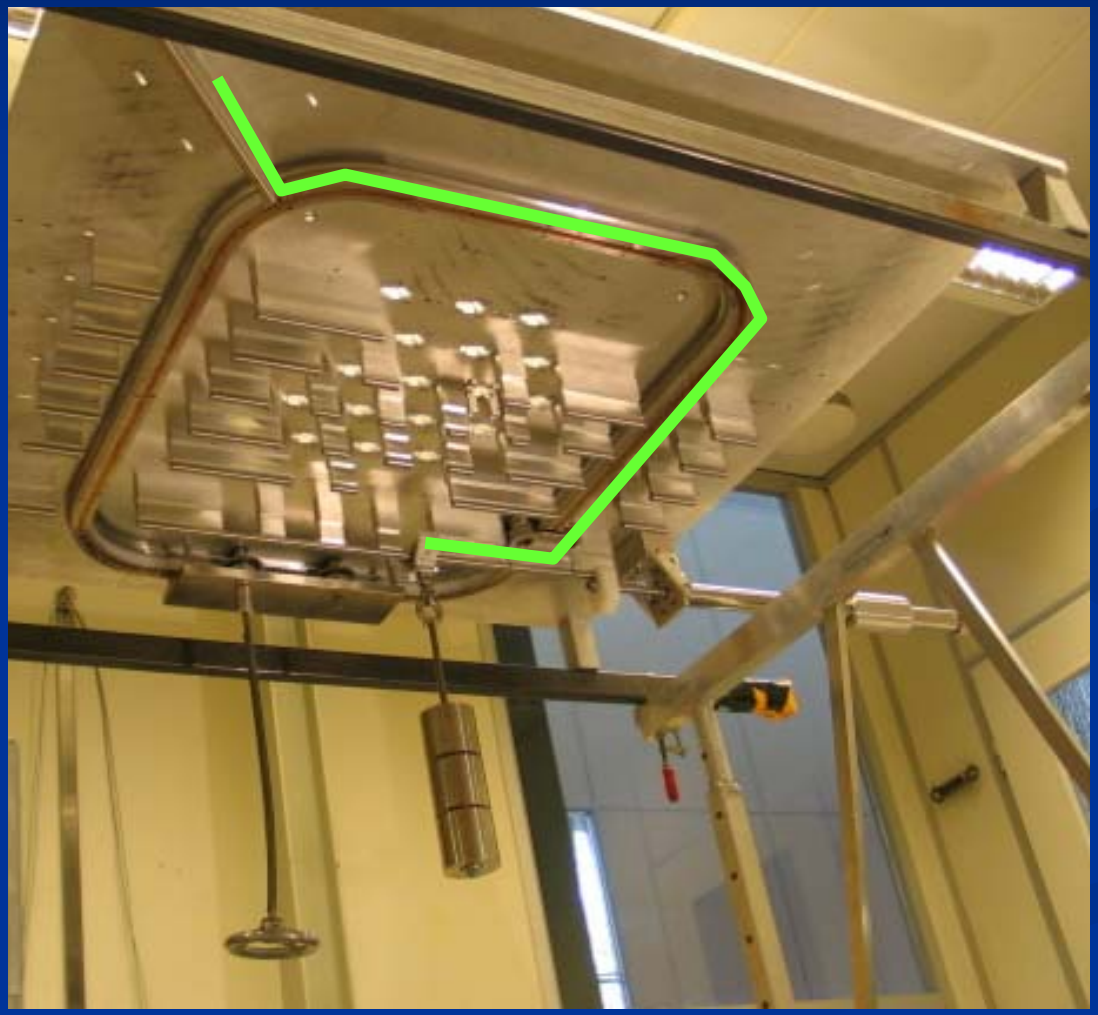
- More and more details of inner transport system are tested ....

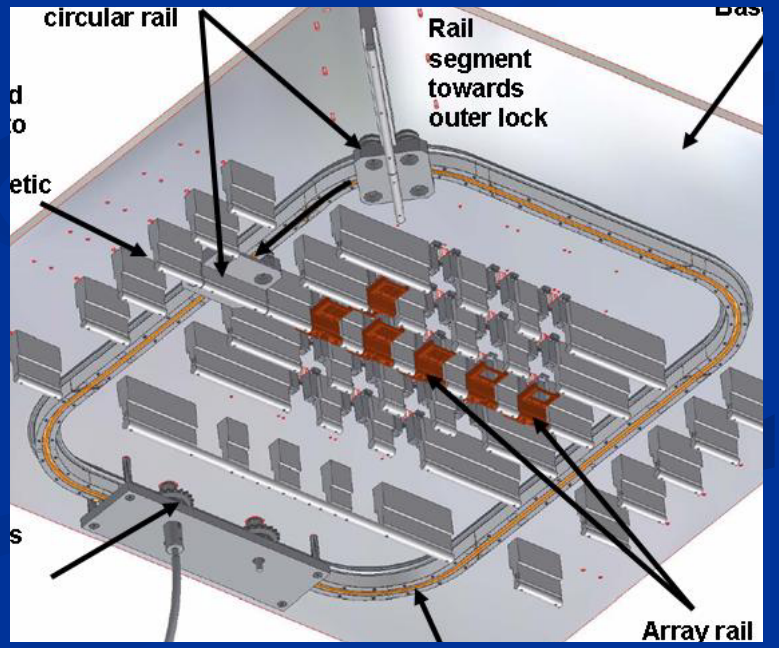
Reminder: Rail System



Rail System: tested Steps

Transportation of detector unit in rail system is successfully tested!





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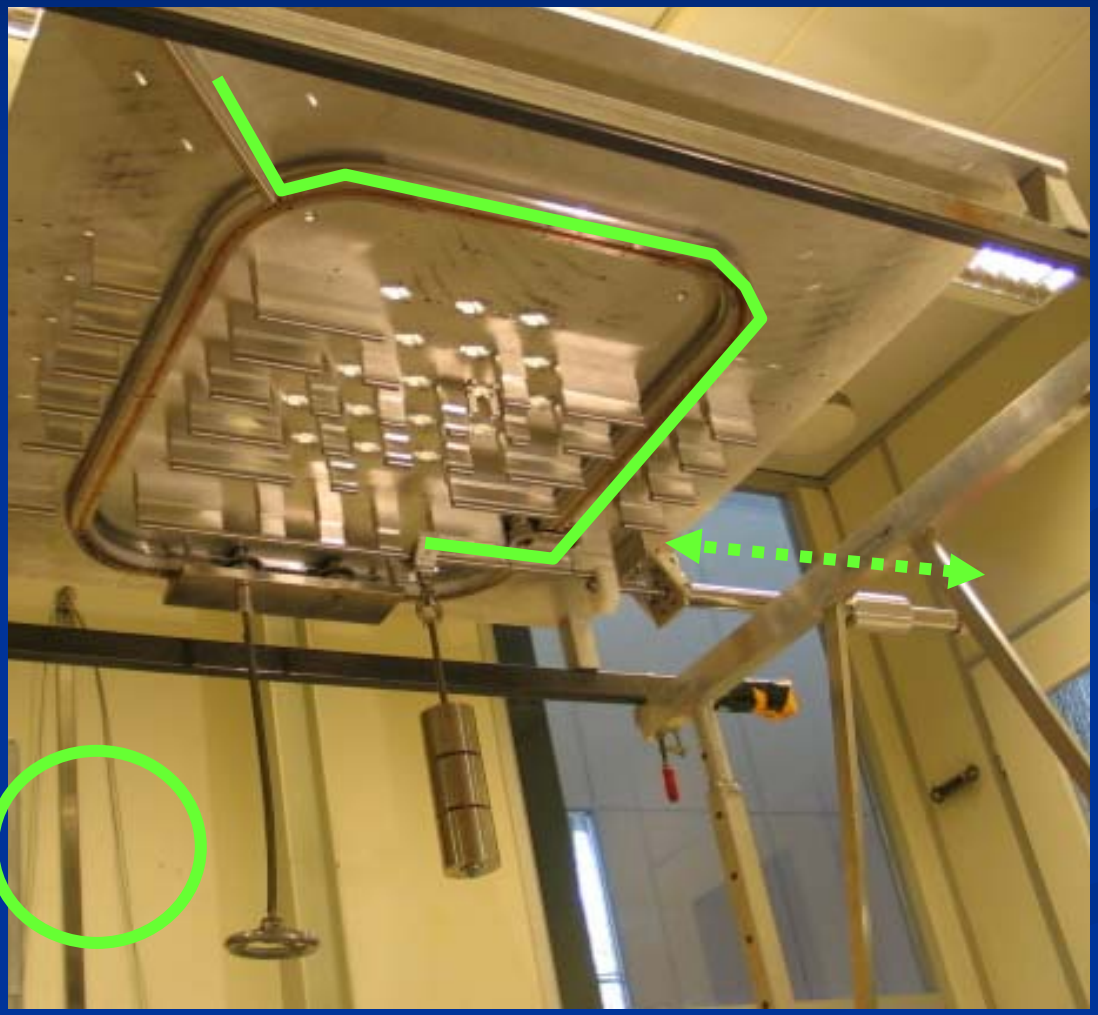
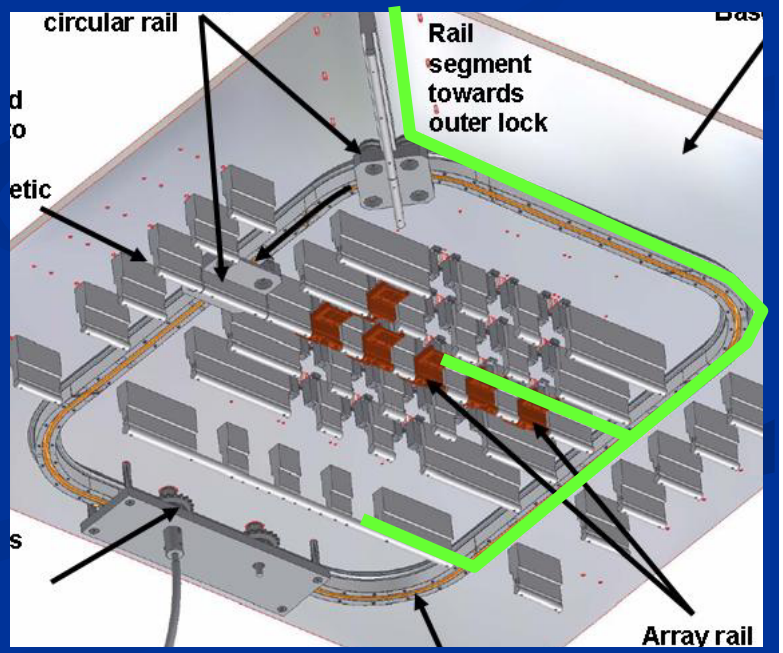
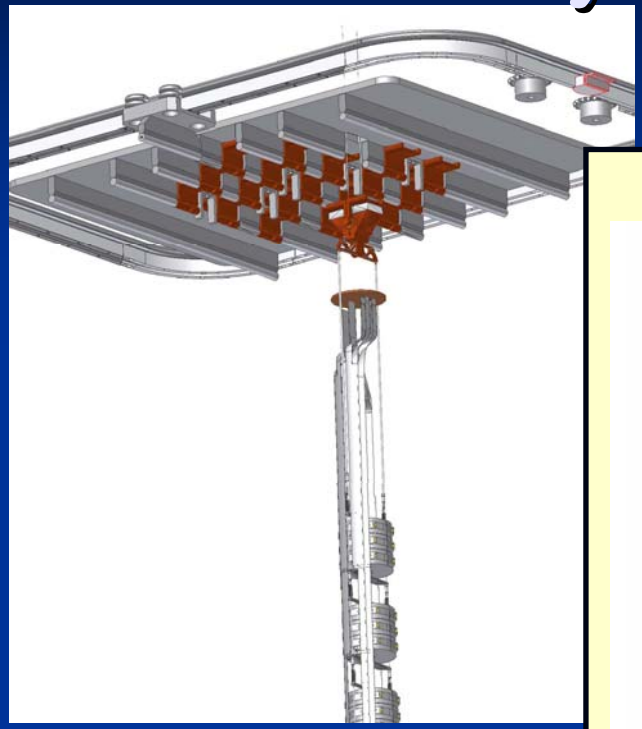
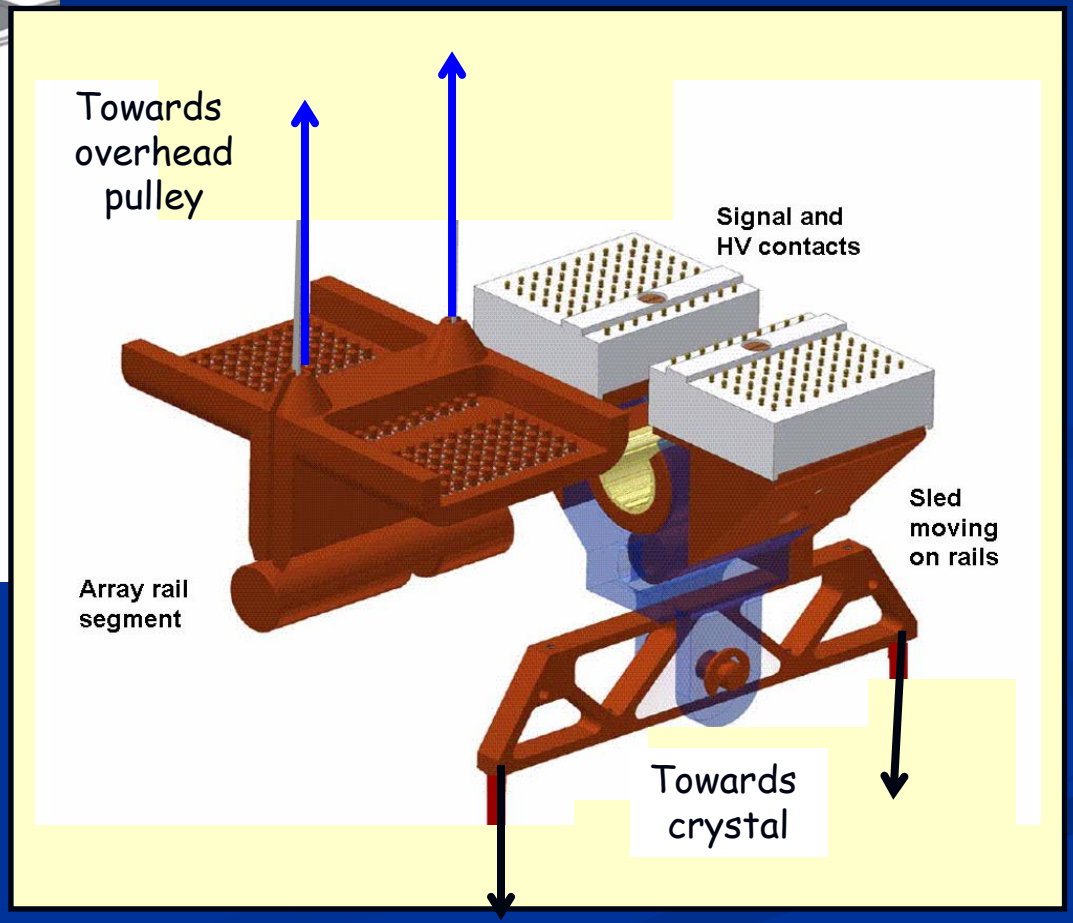




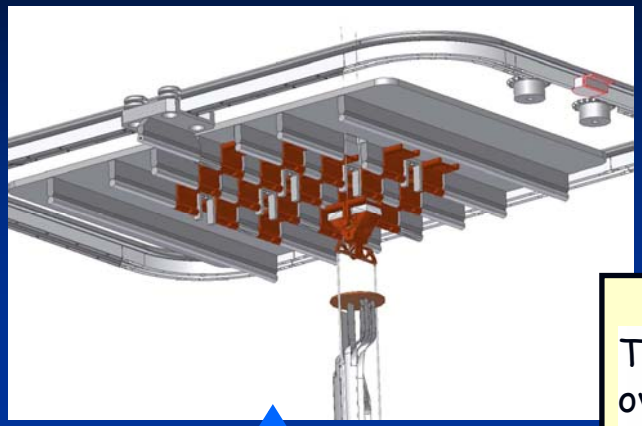
Rail System: Next Tests



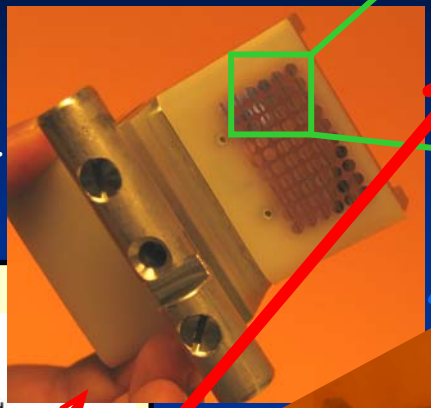


Next steps:
Positioning of sled on array rail segment with safe signal and HV contact

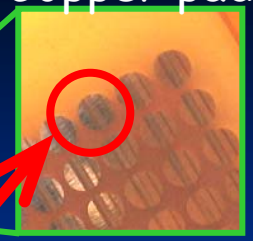
Next Test: Signal and HV Contact

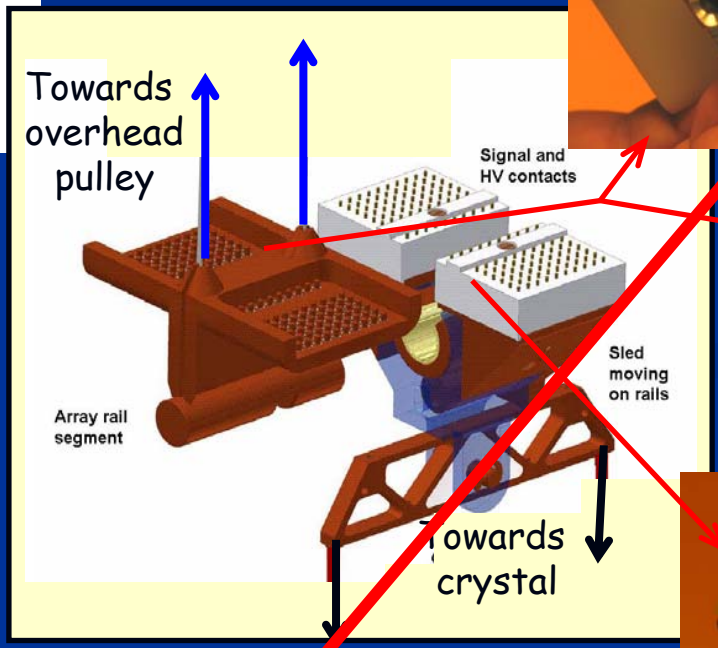


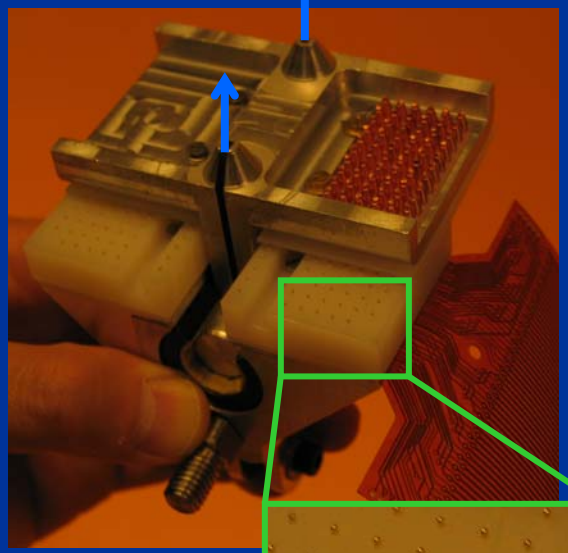
Array Rail Segment



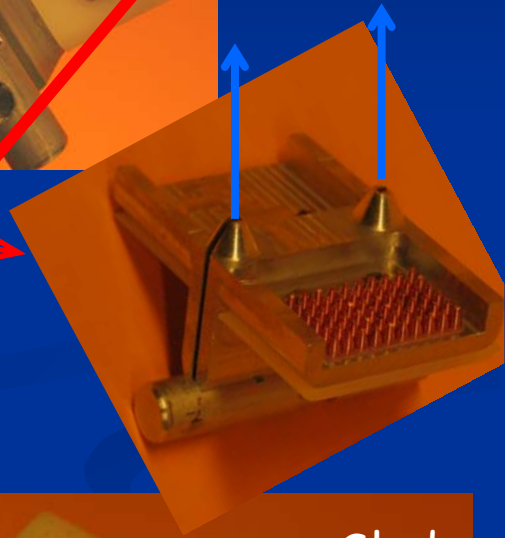
Copper pads







Heads of pogo pins



Sled

Exact alignment neccessary

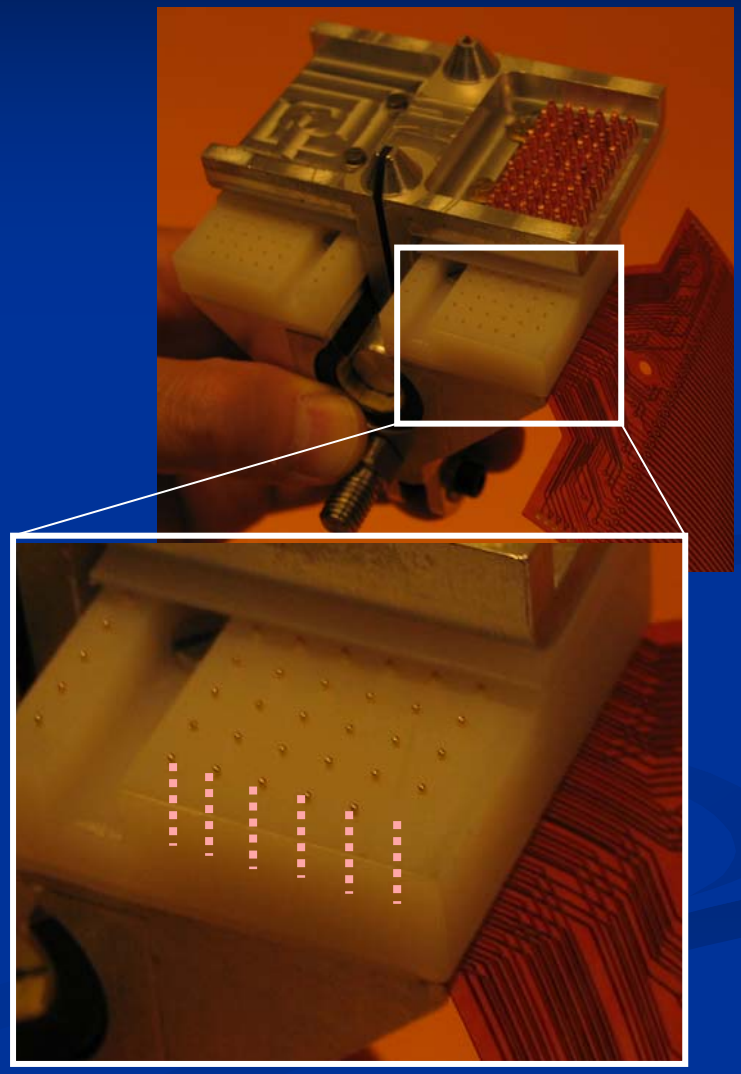
Stability of electrical resistance of Pogo-Pins

- Pogo-pins =
  Conductive pins (~8mm high) and compressible by about 2mm

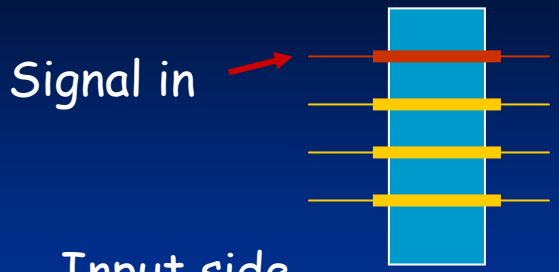
- 100 Pogo pins are located in two arrays in liquid Argon since end of January

- Weekly resistance measurement:
  - all pins had $R < 1\Omega$ in the last 100 days

Resistance remains stable till end of July:
→ Consider Pogo pins will be used!



Cross Talk in Pogo Pin Matrix



1.) Unfiltered signal transmission ?

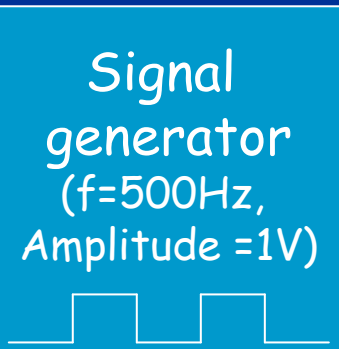
2.) Any signal seen in neighbor channels ?

Input side (crystal + preamplifiers)

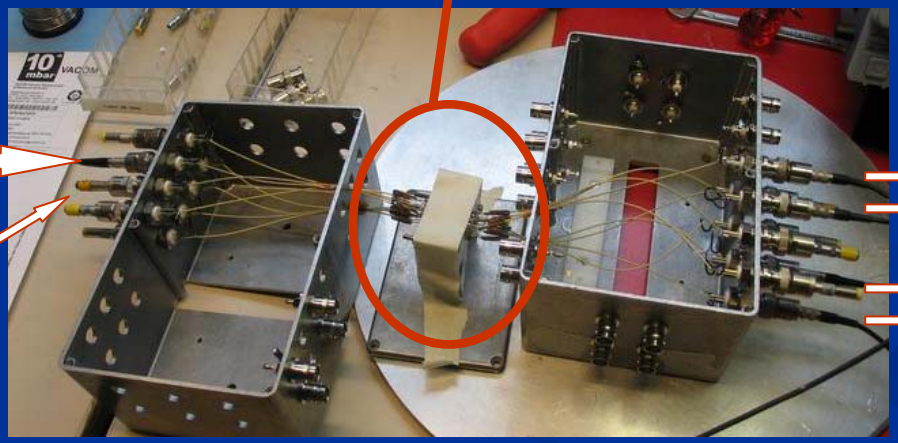
4x4 Pogo pin matrix

Read out electronics

Signal generator (f=500Hz, Amplitude =1V)



Input resistors



Oscil-loscop

1.) Well transmitted signal

- -rise time before /after matrix: 10.8ns / 11.8ns
- → even high frequencies are nearly unfiltered (good for PSA)

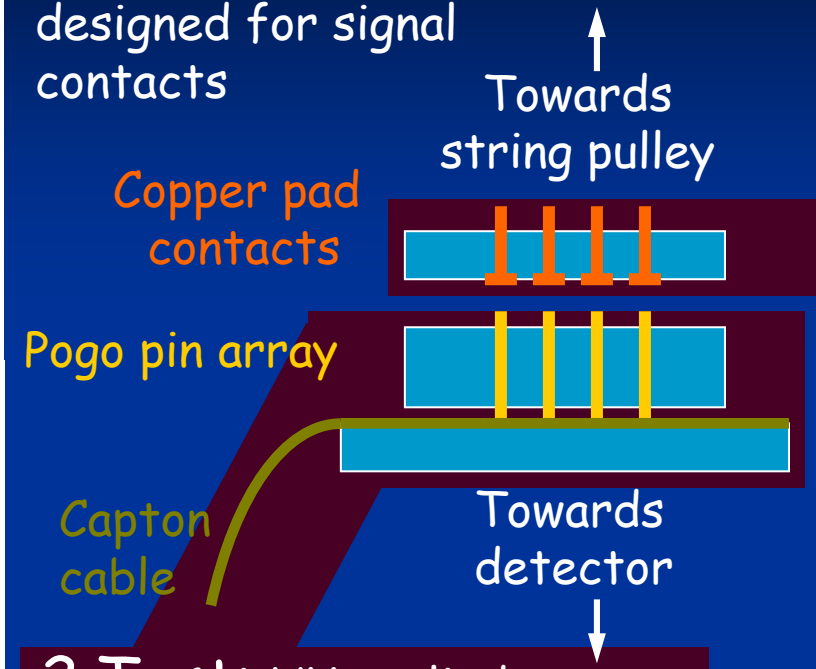
2.) Signal is seen in neighbor channels

- -cross talk: ~1% of input signal is seen in neighbor channels
- -Cross talk equal for all neighbor channels, no distance effect visible
- -size of cross talk depends on grounding scheme and input resistor

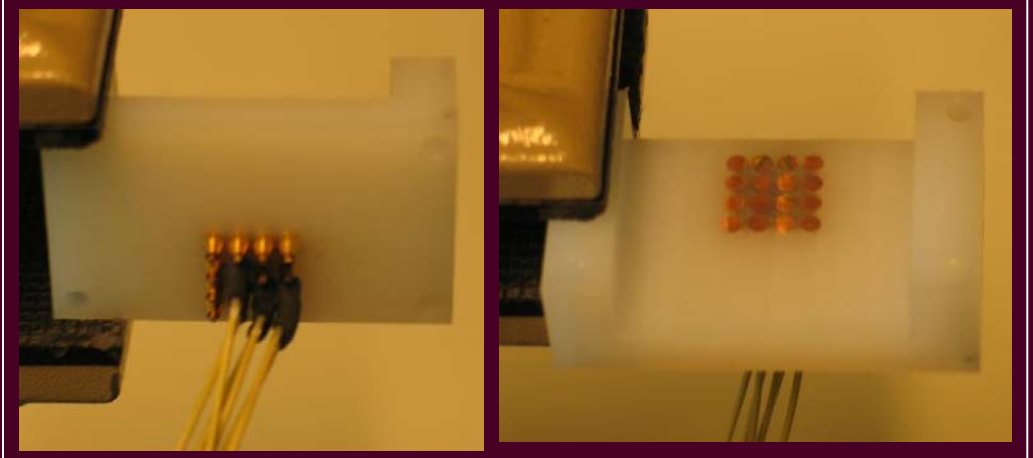
→ cross talk comes from network, i.e. from ground → need stable network

HV through Pogo Pin Matrix

Test HV with matrix designed for signal contacts

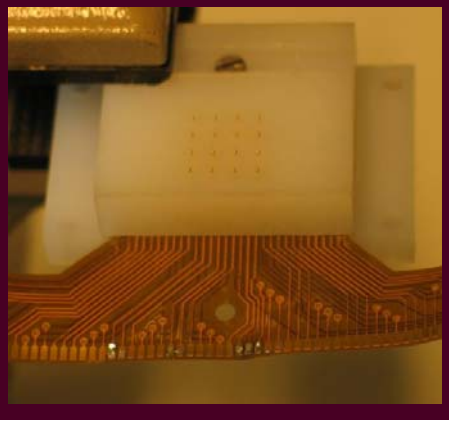


1. Test: HV applied to copper pads



In air
- Spark at 1800V for neighboring pads
- Break through voltage increases w/ distance

2.Test: HV applied to pogo pins and Capton cable



In air
-No sparks seen in pogo pin array
-Spark at 4000V between neighboring conductor pathes

3.Test: HV applied to entire contact system

In liquid Argon
-No sparks at 4000V
→ HV through pogo pin matrix is feasible.

Conclusion

- Clean room:
  - Tendering process is supervised to management of MPI
- String pulley:
  - Strings can be rotated by holding/signal/HV cables
  - → Phase 1: teflon cables
  - → Phase 2: woven CRESST-like cable or cable chains
- Rail system
  - Successful transportation of detector unit from input rail to parking rail
  - Next: towards string array segment, test also contacts
- Pogo pins
  - stable electrical resistance of pogo pins in LAr since ~100 days
  - Array test: ~1% cross talk due to network
  - HV through pogo pin array in LAr feasible