

# SciTil Super-Module Prototype

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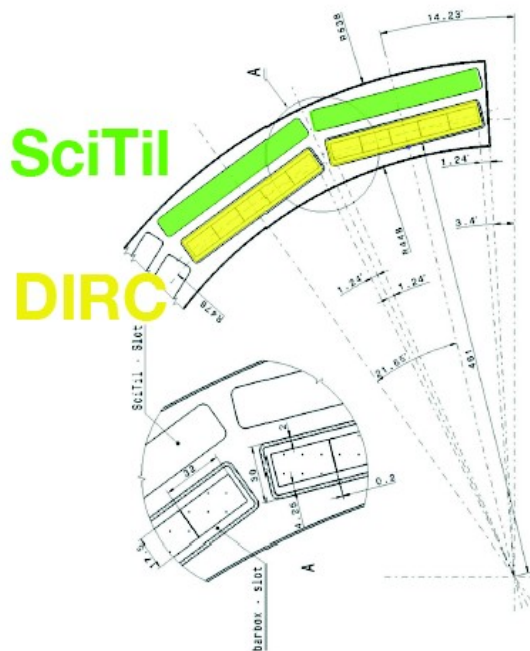
# Outline

- Motivation and idea
- SciTil detector layout
- Super-Module design
- Summary and outlook

# Motivation and idea

- It has been demonstrated that the single tile time resolution is well below 100 ps.  
Last measurement:  $\sigma \sim 55$  ps
- We want to investigate the performance for a larger scale prototype.
- We want to develop and test the mechanics for the SciTil Super-Module.
- Super-Module design will be needed for TDR.
- We would like to build a first Super-Module prototype to advance our current design.
- Super-Module prototype test in combination with other detector prototypes (e.g. EMC)

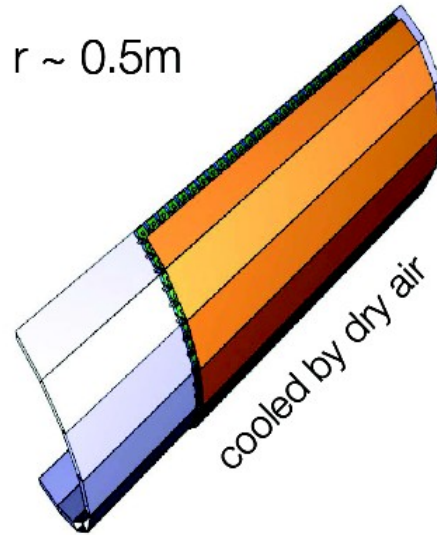
# “Original” SciTil detector layout



SciTil

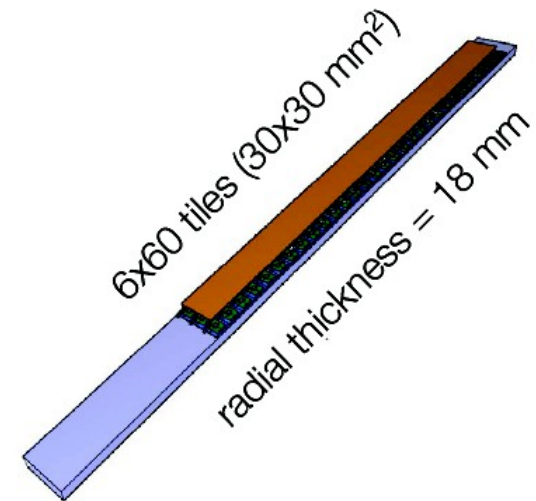
DIRC

$r \sim 0.5\text{m}$

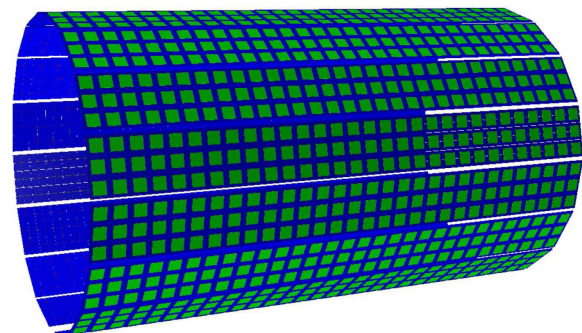


cooled by dry air

8 Super-Modules (SM)  
form half barrel



Super-Module  
= 1800 mm x 180 mm



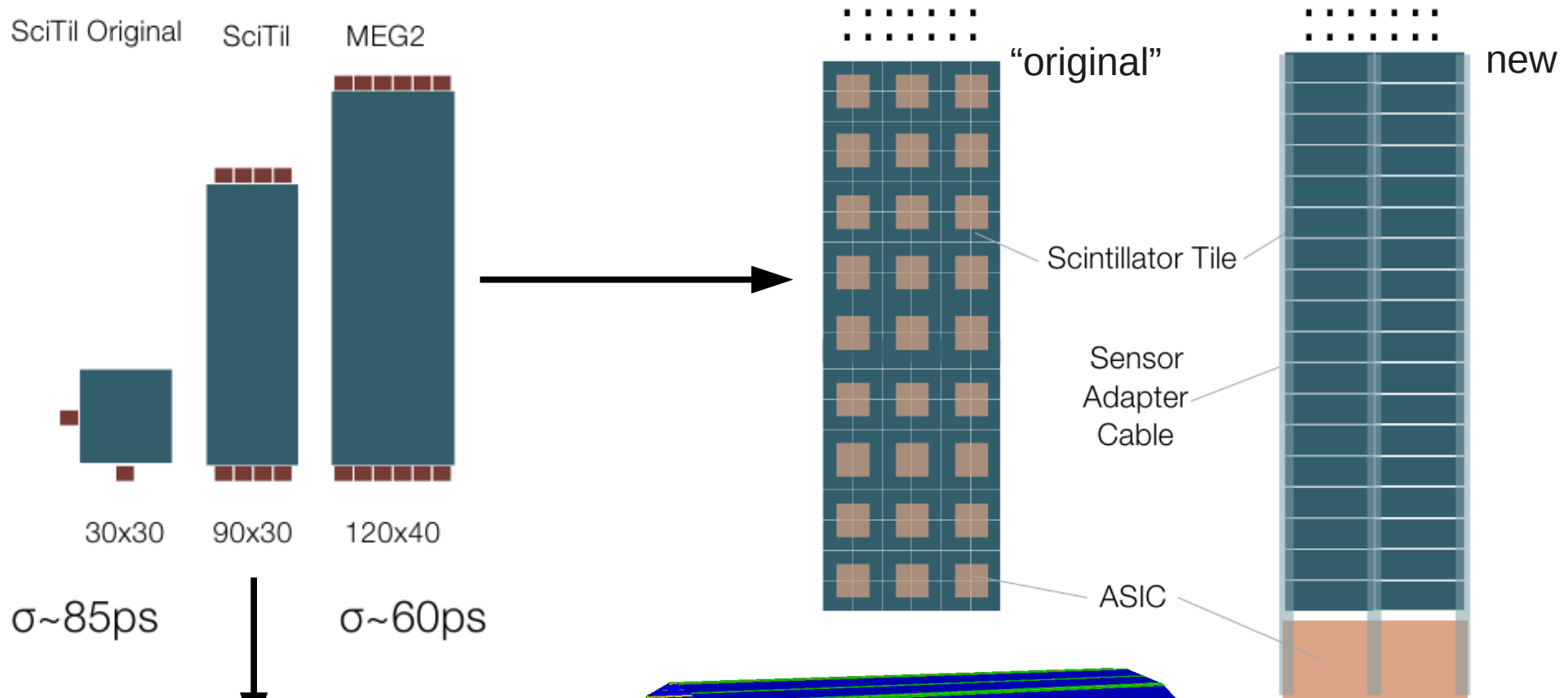
16 SM for full barrel

In total 5760 tiles => 11520 SiPMs => 11520 channels

*K. Goetzen et al.*

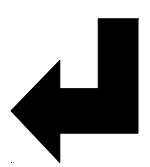
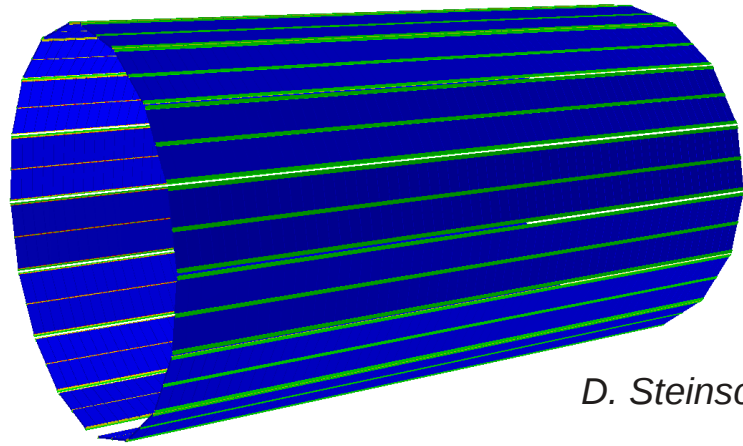
*Proposal for a scintillator barrel hodoscope for PANDA*

# Current SciTil detector layout



$\sigma \sim 55\text{ps}$

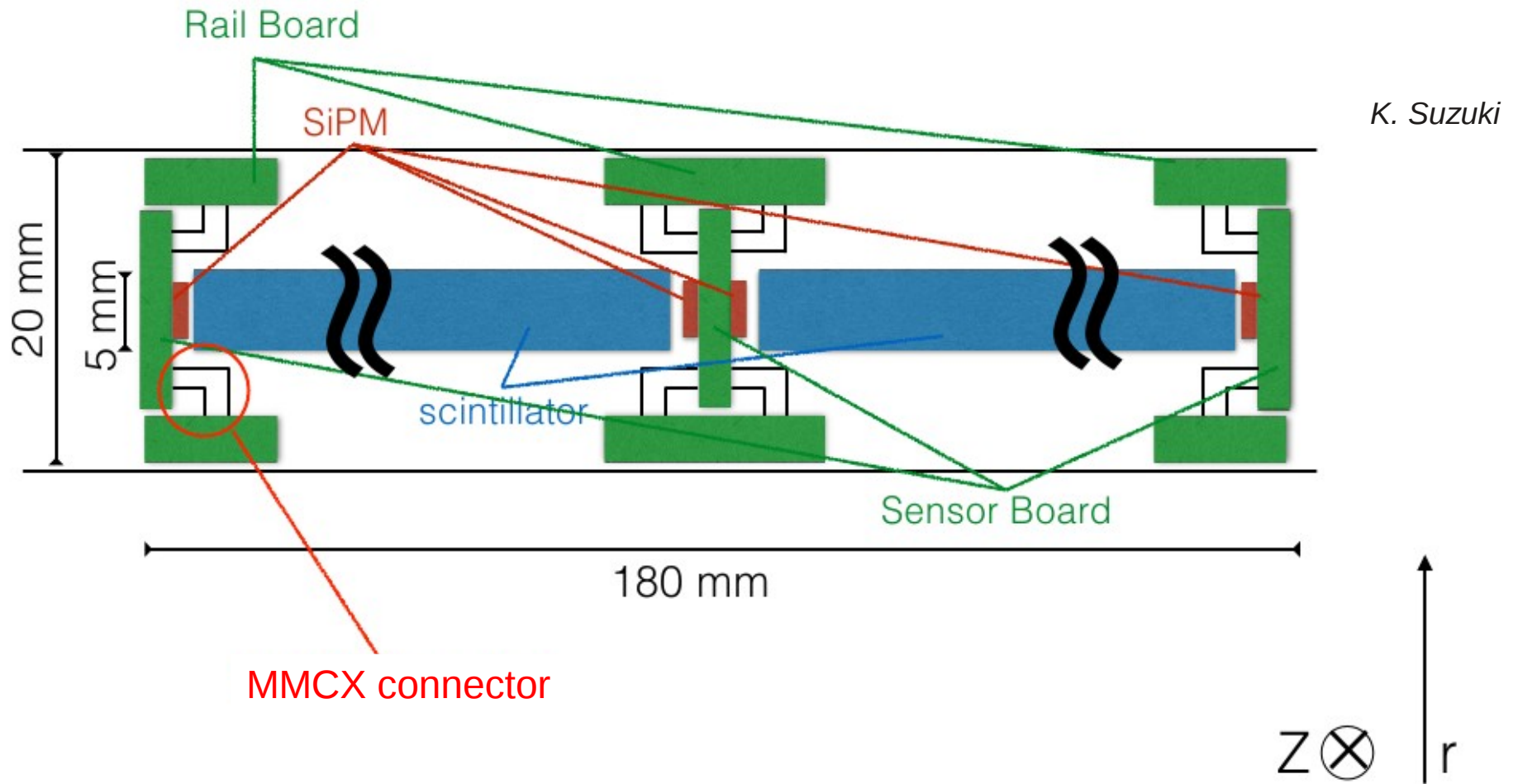
In total 1920 tiles => 15360 SiPMs  
=> 3840 channels



K. Suzuki

D. Steinschaden

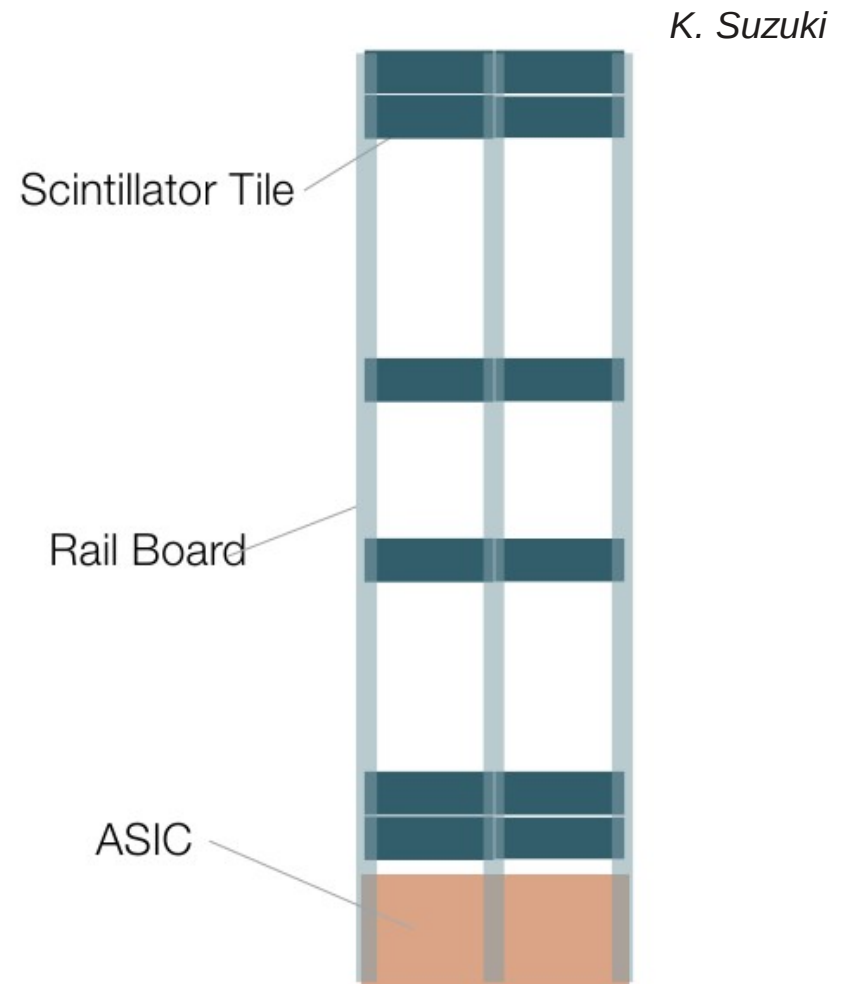
# Super-Module design



# 1<sup>st</sup> Super-Module prototype (Proto1)

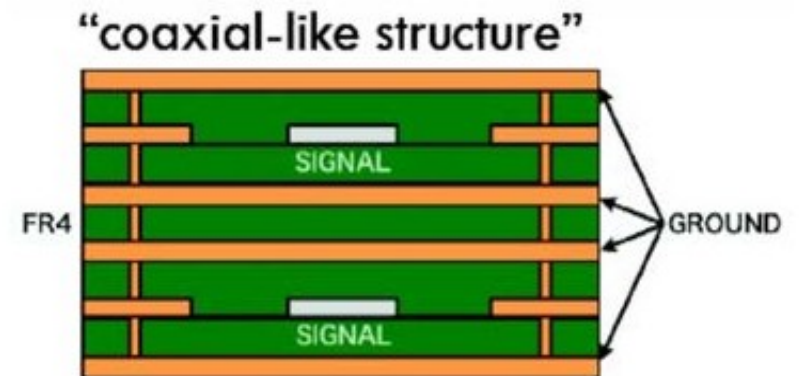
As a first prototype we want to build a half-length Super-Module

- $1800/2 = 900$  mm length
- $30 \times 2 = 60$  channels
- $6 \times 2 = 12$  filled with scintillators



# Multilayer PCB

- PCB for rail boards and sensor boards with coaxial-like structure
  - High density
  - Good shielding from external noise
  - High bandwidth
  - Low crosstalk
  - Mechanical stability



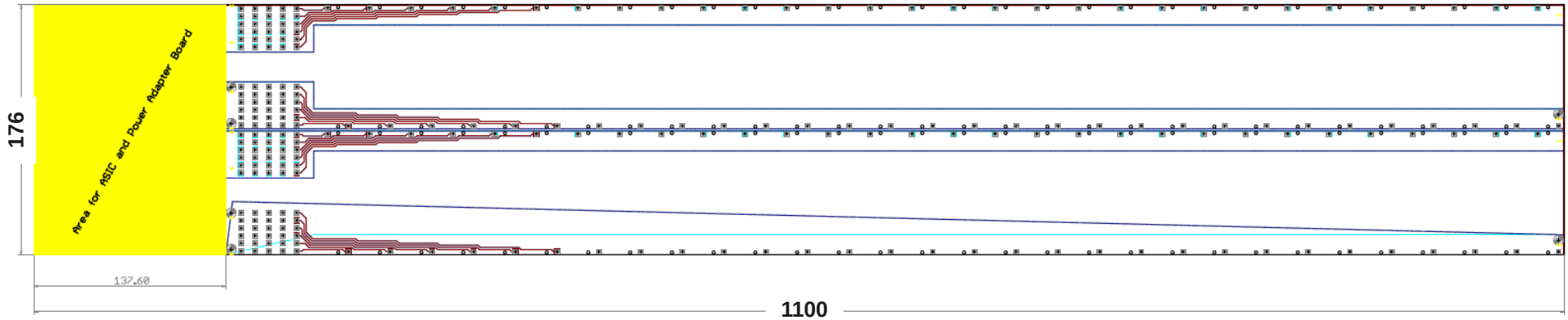
*Design used for MEG2 liquid Xe calorimeter and TOF counter*



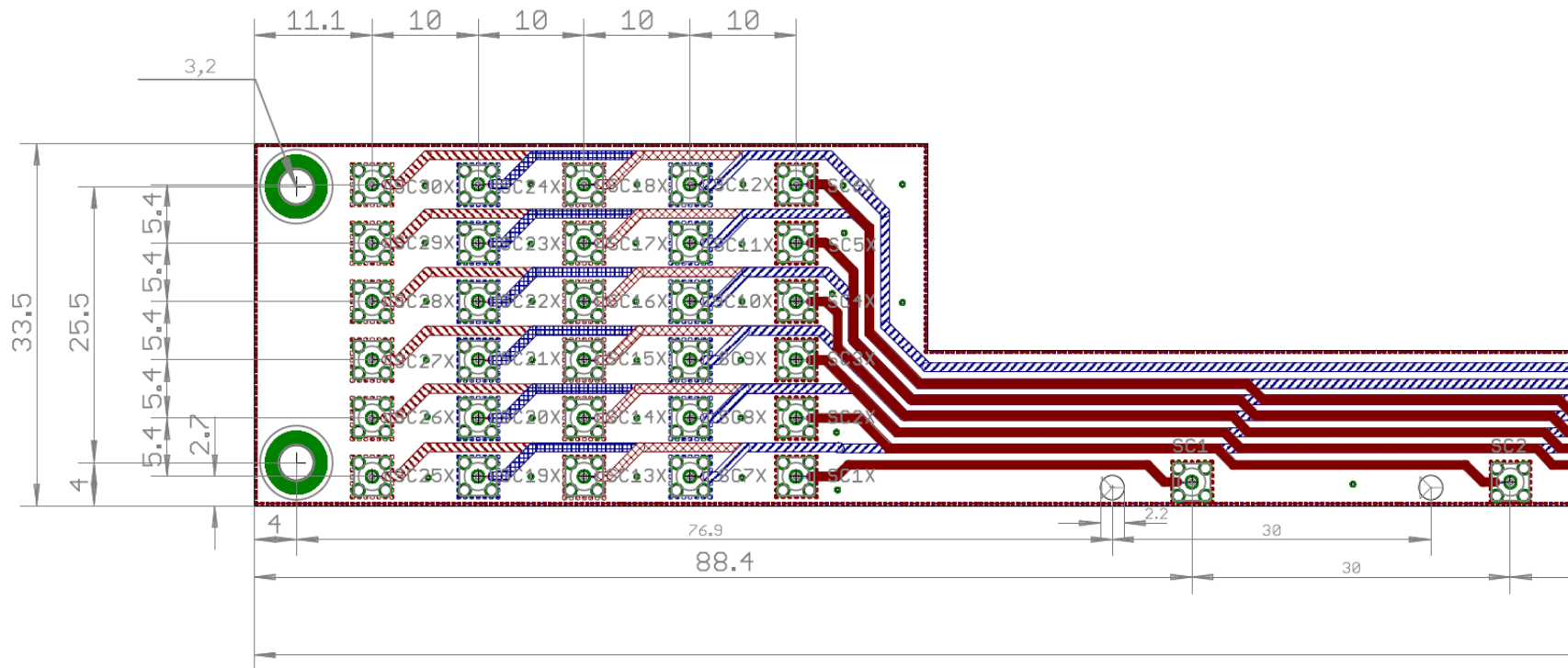
# Rail boards

- Rail board PCBs should have many layers to work as multichannel signal cable.
- Rail boards should give mechanical stability and work as part of the support structure.
- Dimensions and parameters for SciTil Super-Module
  - 1800 mm length
  - $60 \times 2 = 120$  channels
- Our current design (for half-length Super-Module)
  - 14 layers
  - Total thickness 2.33 mm
  - 15 mm width
  - 4 signal lines in parallel
  - 30 channels per board

# Rail boards

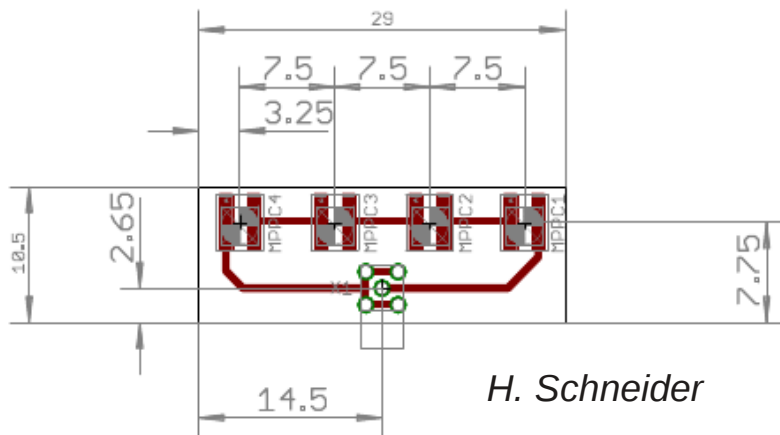


H. Schneider

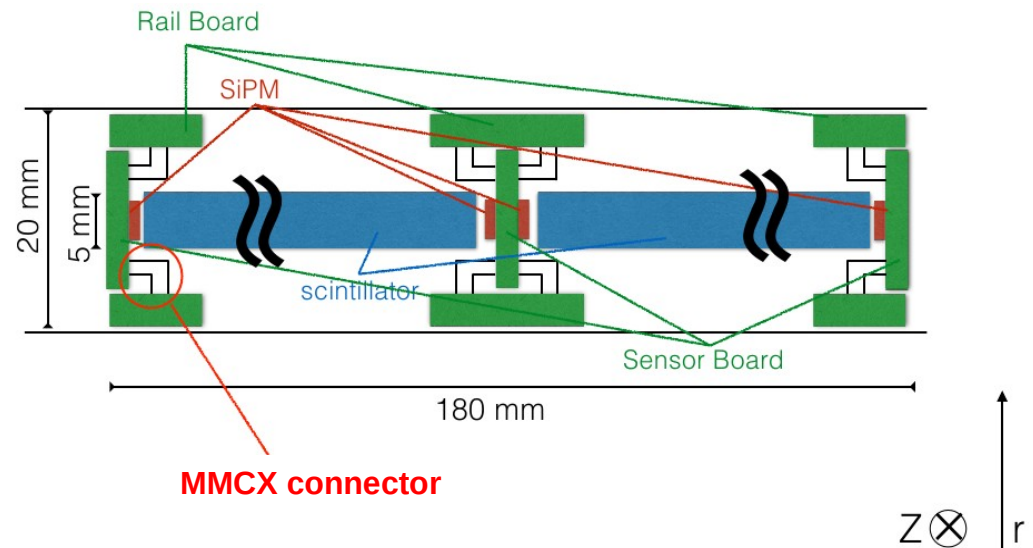


# Sensor boards

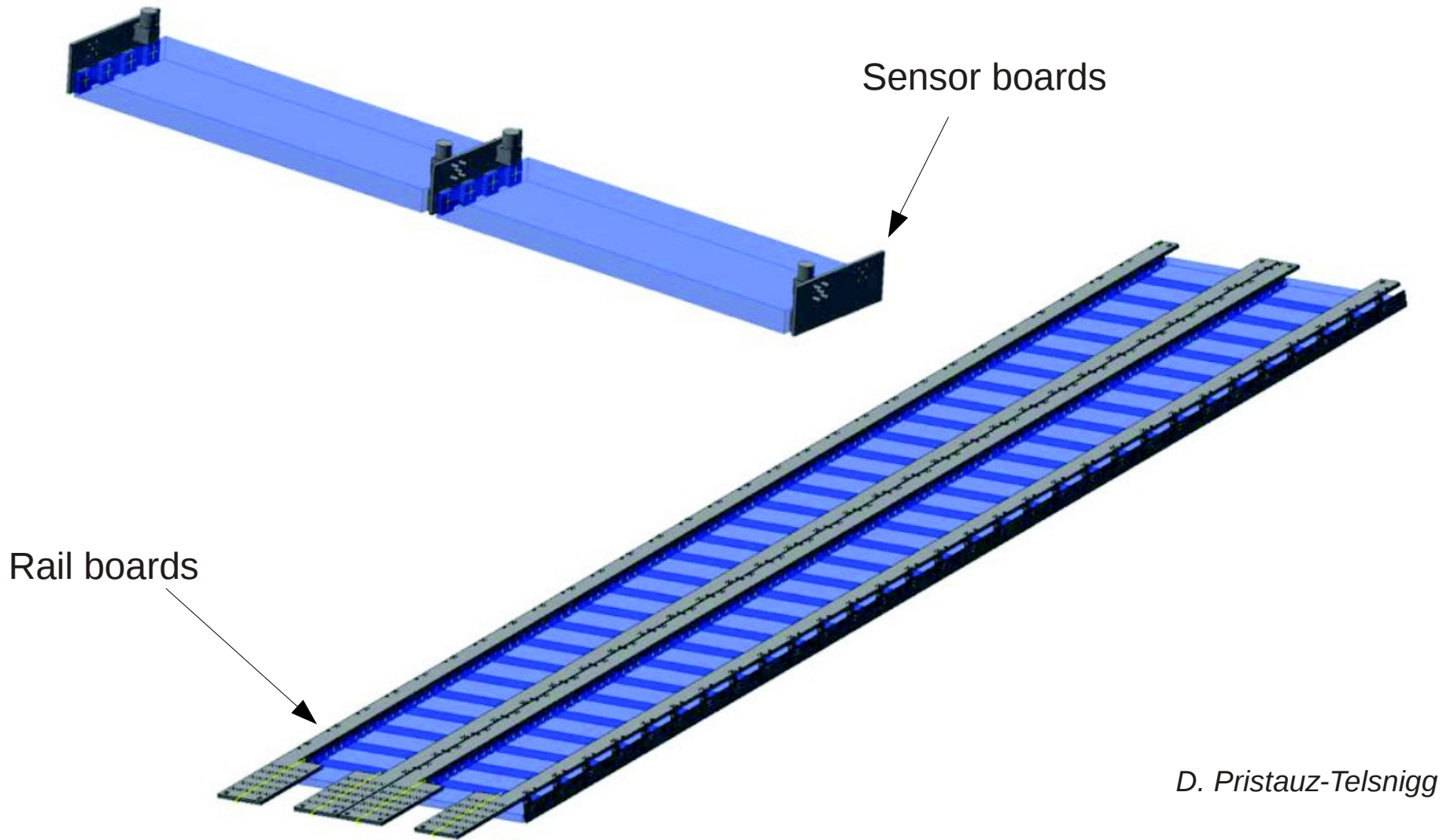
- Sensor board PCBs should accommodate 4 SiPMs connected in series.
- We need two versions of the sensor board. One for the side of the SM and one in the middle. (Single-/Double-sided SiPM assembly)
- MMCX connector (L-shaped) to connect sensor board and rail board.



Thickness 0.82 mm



# Proto1 design



*D. Pristauz-Telsnigg*

# Summary and outlook

- The 1<sup>st</sup> SciTil Super-Module prototype design and construction is under way
- We will build a half-length Super-Module prototype first
- The design is based on multilayer PCB boards (rail and sensor boards)
- Main things to test:
  - Rail board concept
  - Mechanical design and support
  - Performance
  - Integration of FEE (TOFPET chip)
- Update at the next PANDA meeting