C and CH_2 Targets for STT Modules

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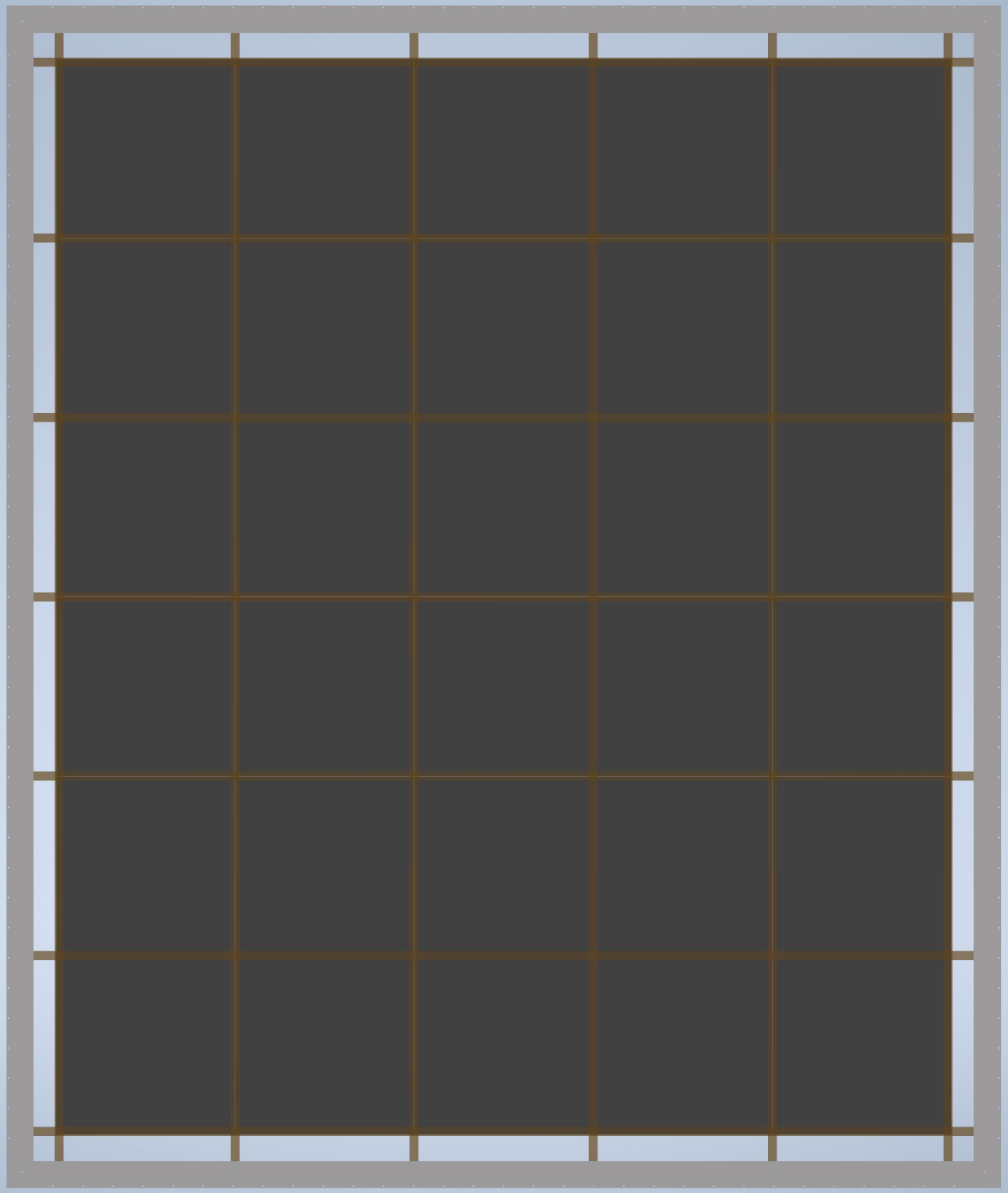
GRAPHITE TARGETS

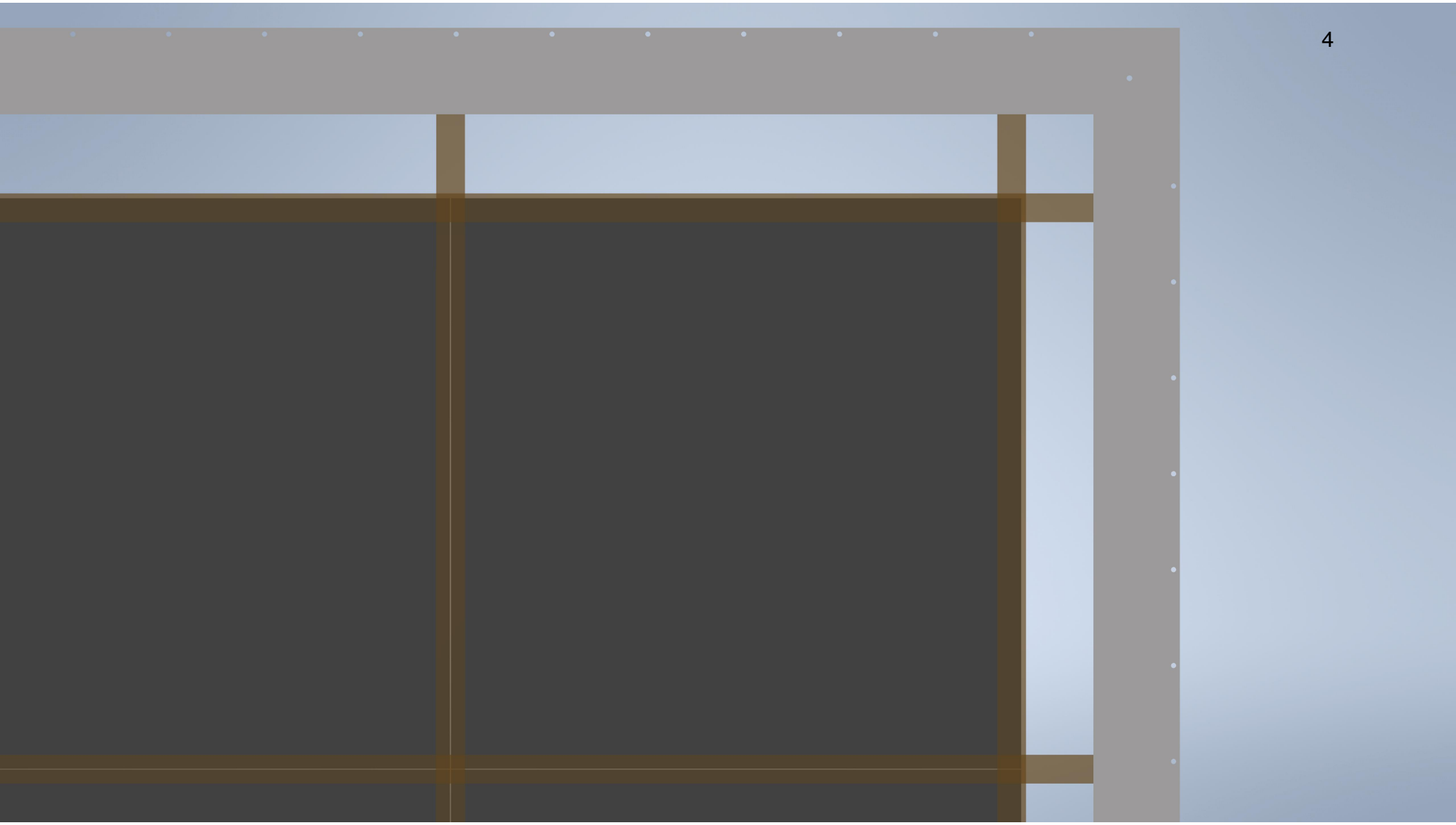
- *Graphite target mounted in front of common XXYY straw tracking module.*
- *Graphite tiles 595 mm $\times$ 595 mm $\times$ 4 mm stacked and held in place by thin C-fiber woven tape (30mm, $\sim$50 g/m^2), sandwiched between C-composite beams*
- *Fraction of fiducial mass from C-fiber woven tape* $\sim 1.5 \times 10^{-3}$

  $\Longrightarrow$ *Chemical purity of C-fiber tape (mostly C) not critical*
- *Graphite tiles only cover standard fiducial volume (20 cm from ECAL surface).*
- *Tiles machined from isostatic graphite, which is formed by cold isostatic pressing and has high purity, high strength and volume densitiy* ~ 1.8 *g/cm*^{3}

  $\Longrightarrow$ *Prototypes of graphite target tested at USC*

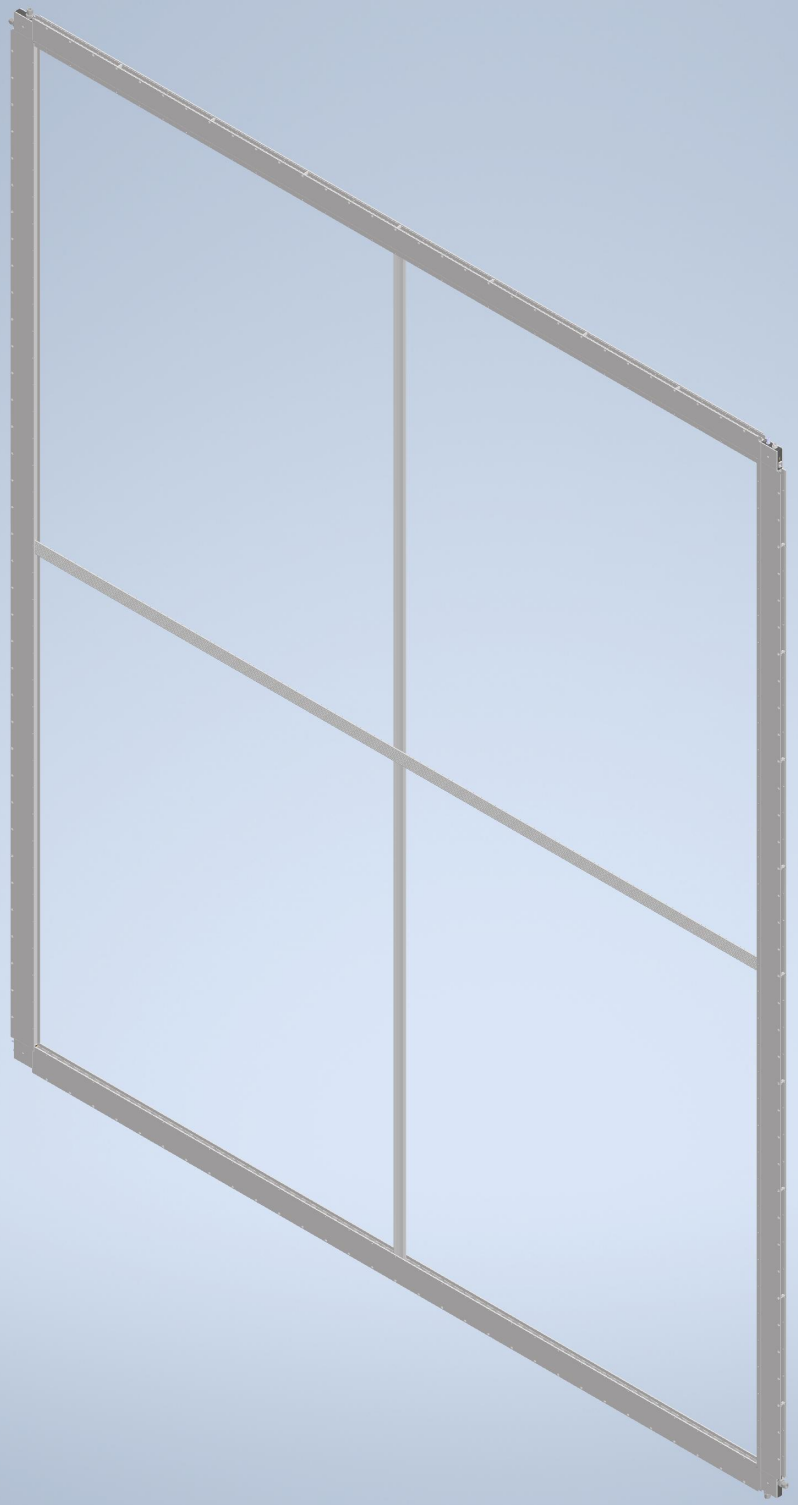
Graphite target (4m × 3.3m) with 30 graphite tiles and C-fiber tapes





Details of the tile assembly in the STT graphite target

Frame of the STT Tracking module (4m × 3.3m) based on design of the 1.2m CERN prototype (F. Raffaelli)



Frame of the STT Tracking module (4m × 3.3m) based on design of the 1.2m CERN prototype (F. Raffaelli)

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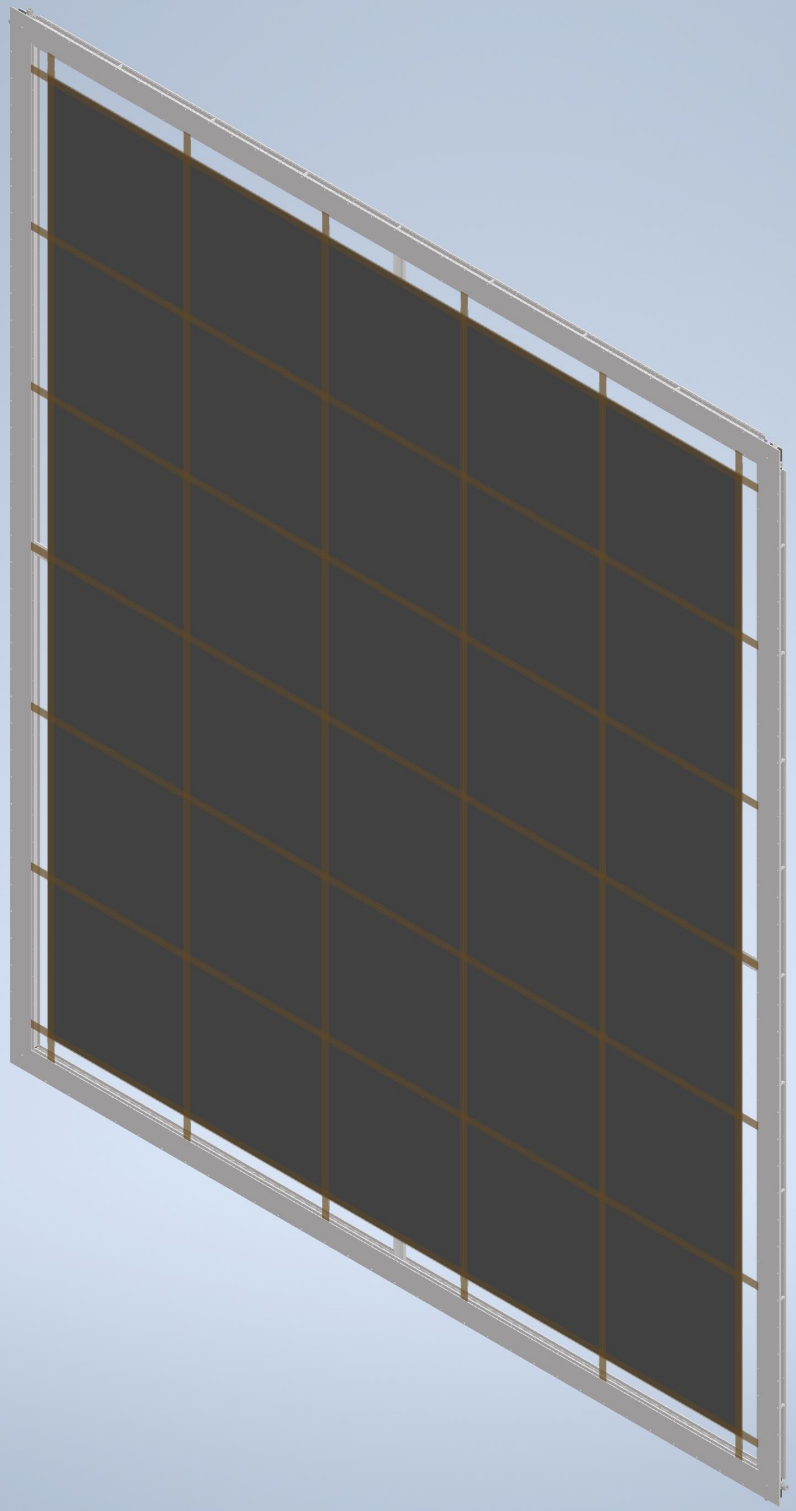
Graphite target installed



POLYPROPYLENE TARGETS & RADIATORS

- *Polypropylene (CH_2) tiles 595 mm $\times$ 595 mm $\times$ 5 mm stacked and held in place by thin polypropylene tape (30mm), sandwiched between C-composite beams*

  $\Longrightarrow$ *Same material for tiles and tape (100% chemical purity)*

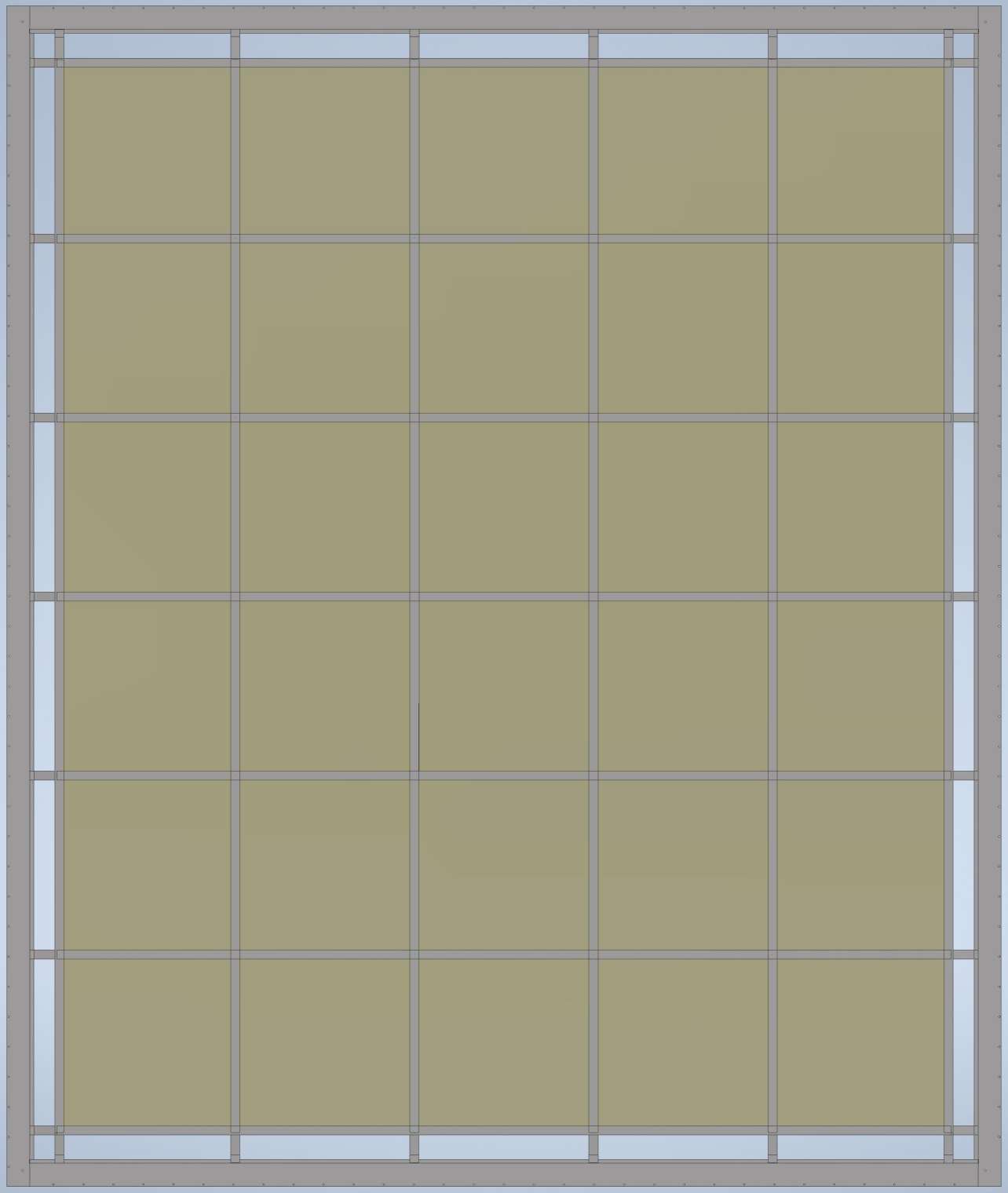
- *Polypropylene tiles only cover standard fiducial volume (20 cm from ECAL surface).*

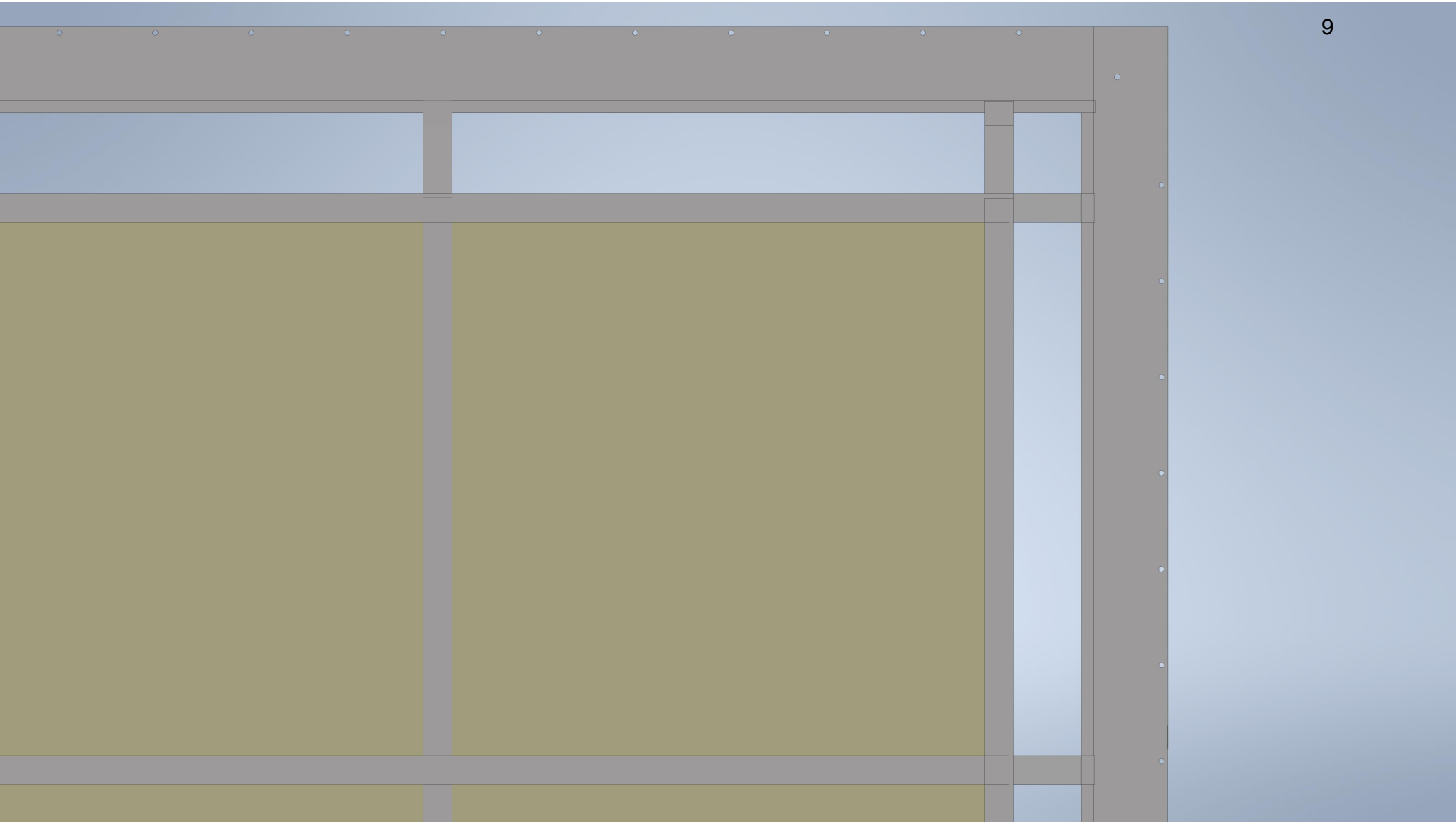
- *Radiators made of 105 CH_2 foils 18 μm thick (1.89 mm CH_2 total), separated by 117 μm air gaps and sandwiched between C-composite beams*

  $\Longrightarrow$ *Radiators account for close to 30% of the total CH_2 fiducial mass in STT*

- *Radiators fill gaps left by supporting frame before and after XXYY straw layers*

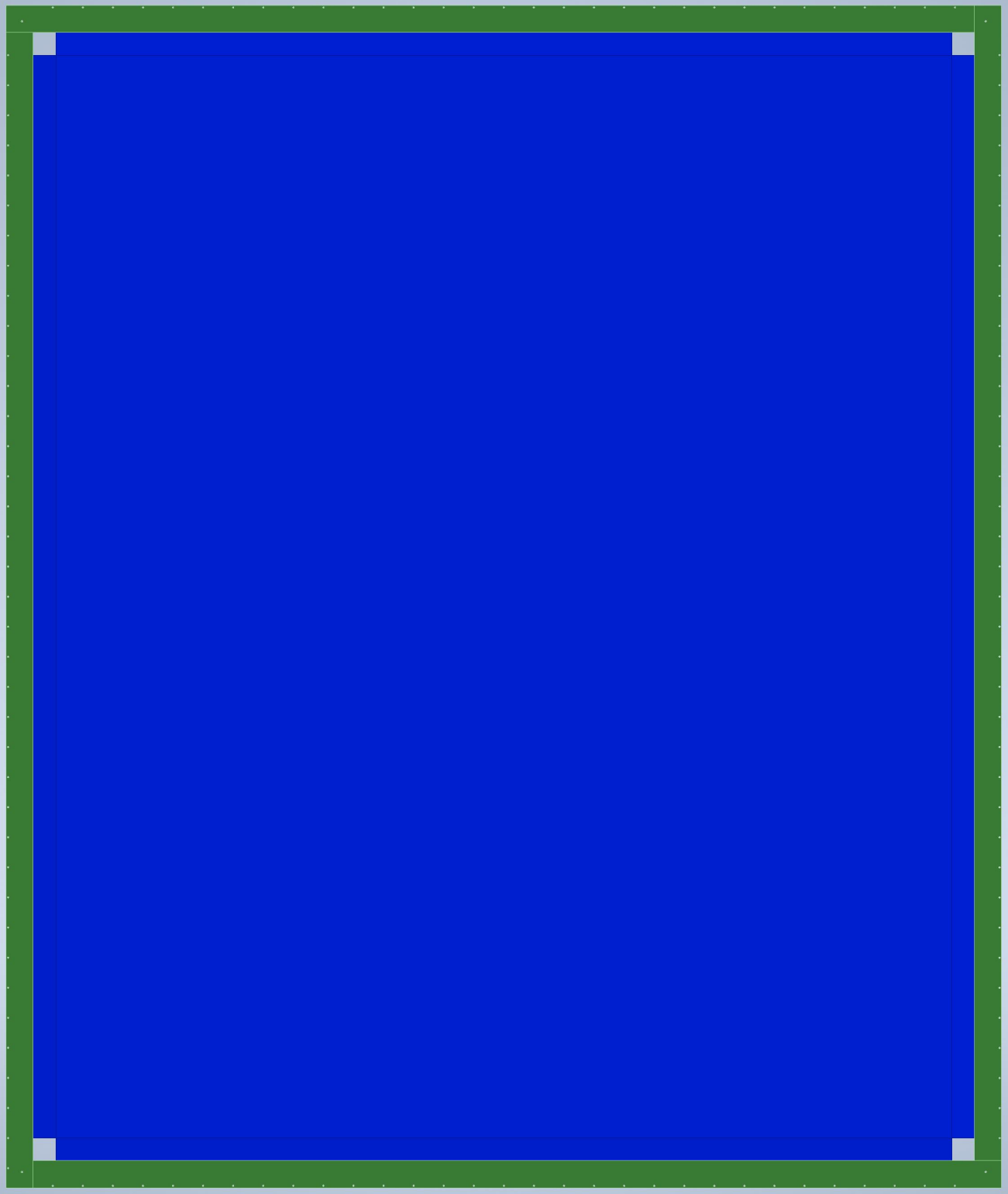
Polypropylene target (4m × 3.3m) with 30 CH_2 tiles and CH_2 tapes

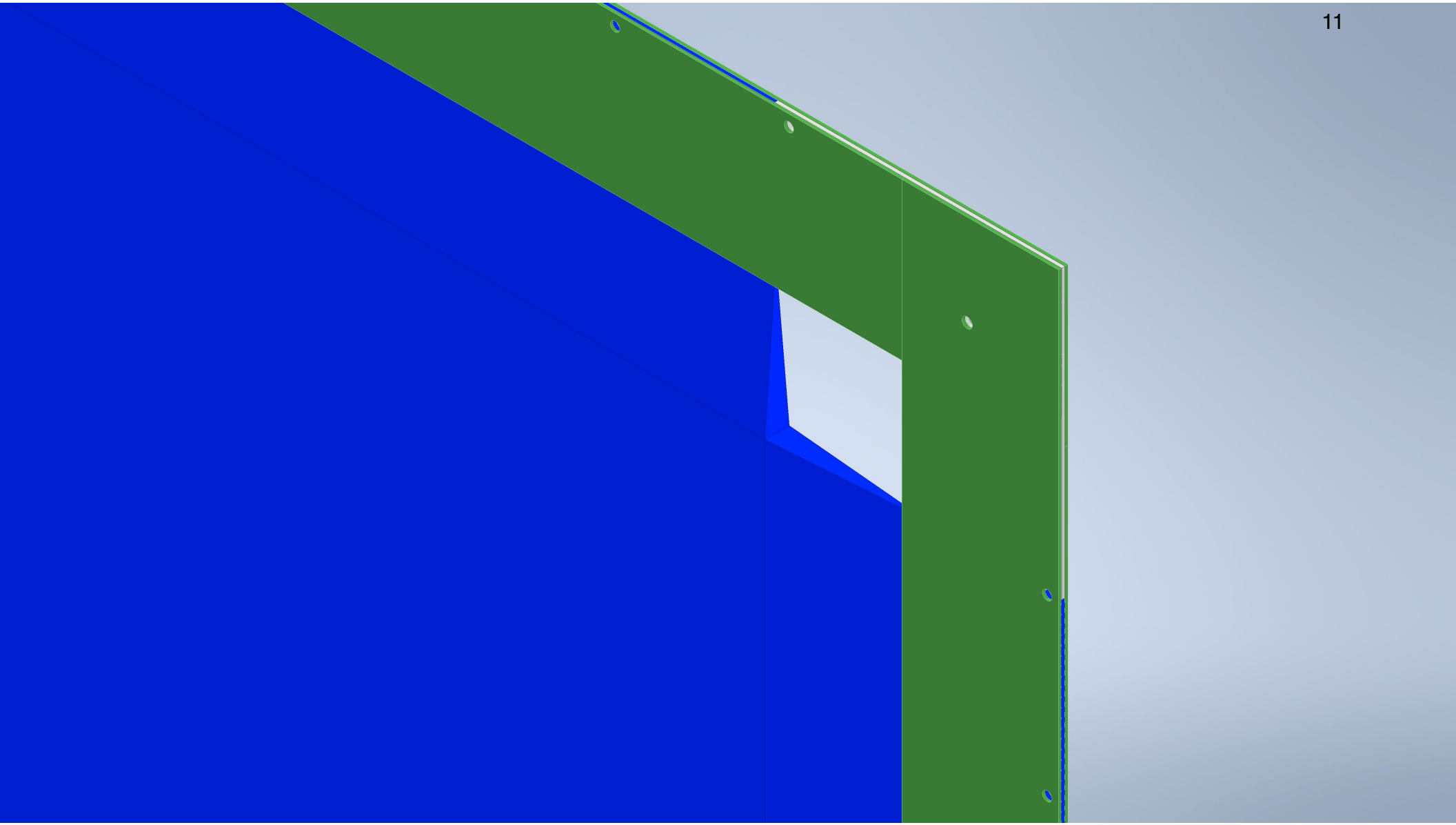




Details of the tile assembly in the STT polypropylene (CH_2) target

Radiator assembly (4m × 3.3m) with 105 CH_2 foils





Details of the radiator assembly for the STT modules equipped with CH_2 targets

CONFIGURABLE MODULES

- *CH_2 targets and radiators can be individually removed/replaced from tracking modules*

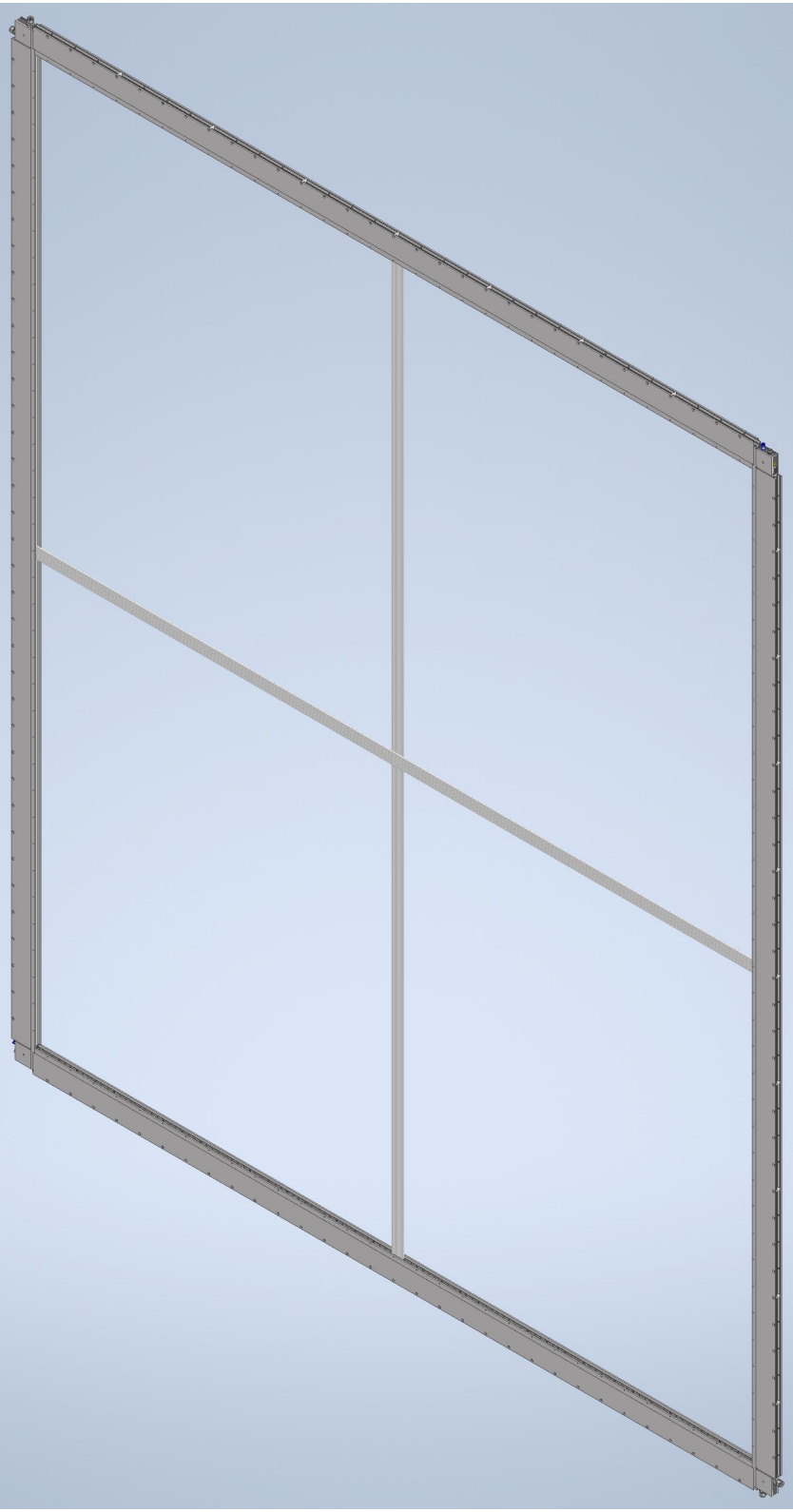
  $\Longrightarrow$ *Flexible design allowing different configurations*

- *Target + radiator mounted onto base STT tracking module*
  - *Default configuration corresponding to the nominal CH_2 fiducial mass (6.89 mm total per module);*
  - *Electron identification from TR (Xe/CO_2 70/30): $\sim 10^3$ pion rejection for $E > 0.5$ GeV.*

- *Only target mounted onto base STT tracking module*
  - *Fiducial mass reduced by $\sim$ 30% (5 mm CH_2 per module), gas mixture Ar/CO_2 70/30;*
  - *Option to add 16 extra STT modules (100 total) in extra space, resulting in +20% increase.*

- *Only radiator mounted onto base STT tracking module*
  - *Fiducial mass reduced by $\sim$ 70% (1.89 mm CH_2 per module), gas mixture Xe/CO_2 70/30;*
  - *Low-density run with increased resolution for precision measurements and/or reduced backgrounds.*

Frame of the STT Tracking module (4m × 3.3m) based on design of the 1.2m CERN prototype (F. Raffaelli)



Frame of the STT Tracking module (4m × 3.3m) based on design of the 1.2m CERN prototype (F. Raffaelli)

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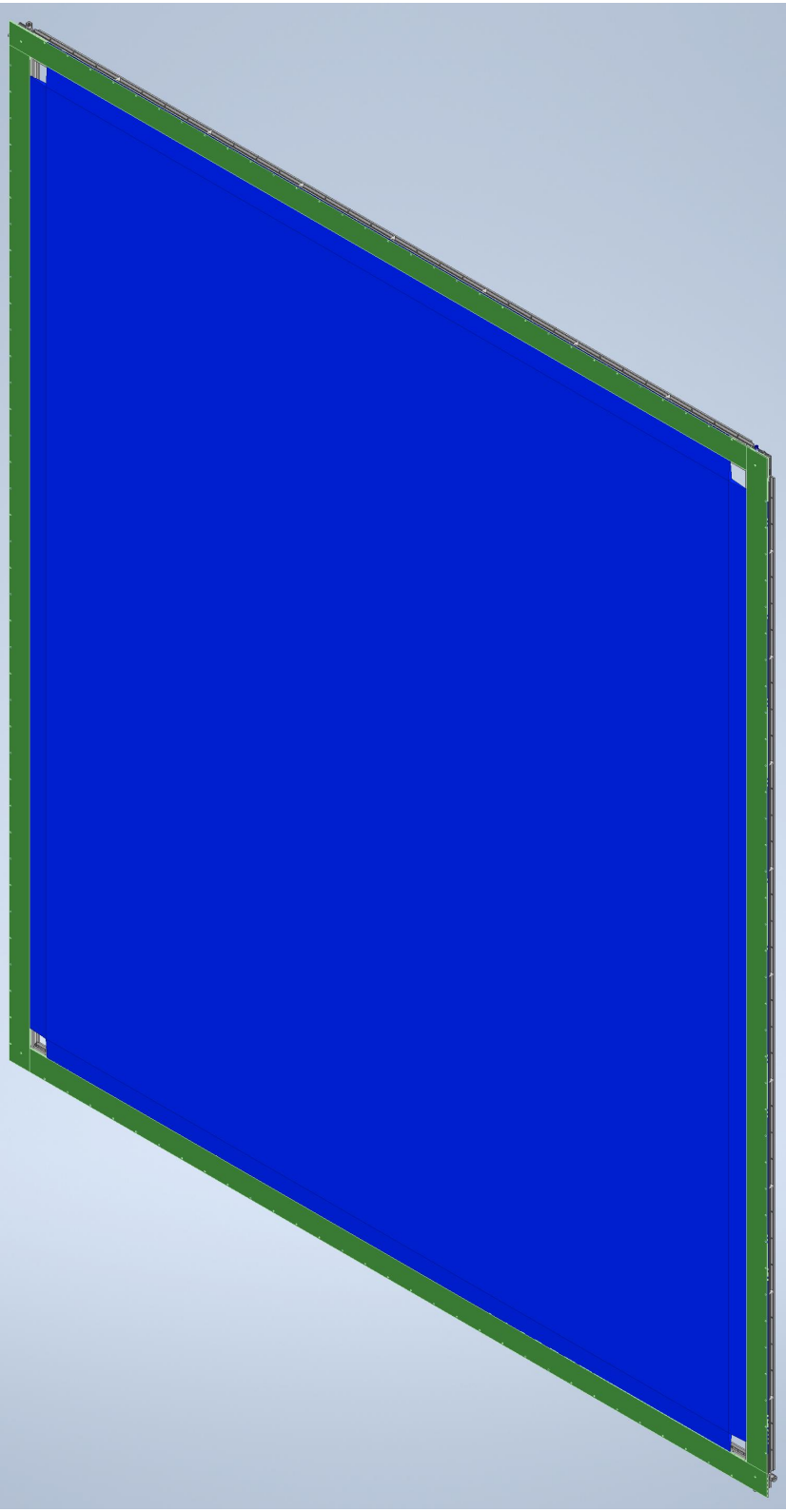
Radiator (CH_2) assembly



Frame of the STT Tracking module (4m × 3.3m) based on design of the 1.2m CERN prototype (F. Raffaelli)

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Radiator (CH_2) assembly

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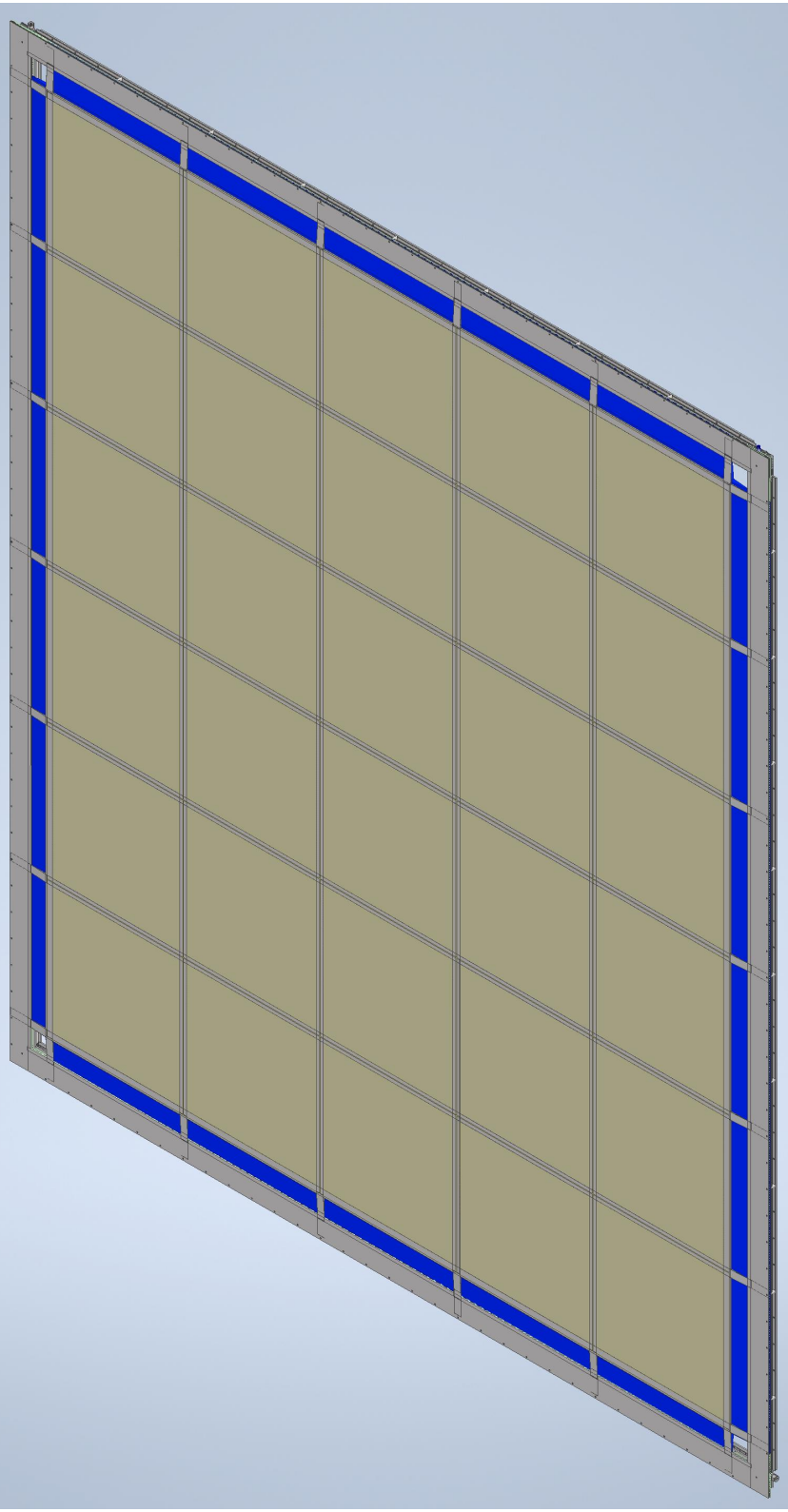
Polypropylene (CH_2) target



SUPER-MODULE ASSEMBLY

- *Default super-module with 1 C + 9 CH_2 modules for a total thickness of $\sim$ 371 mm*

  $\Longrightarrow$ *Both number of modules and their spacing can be modified after installation*

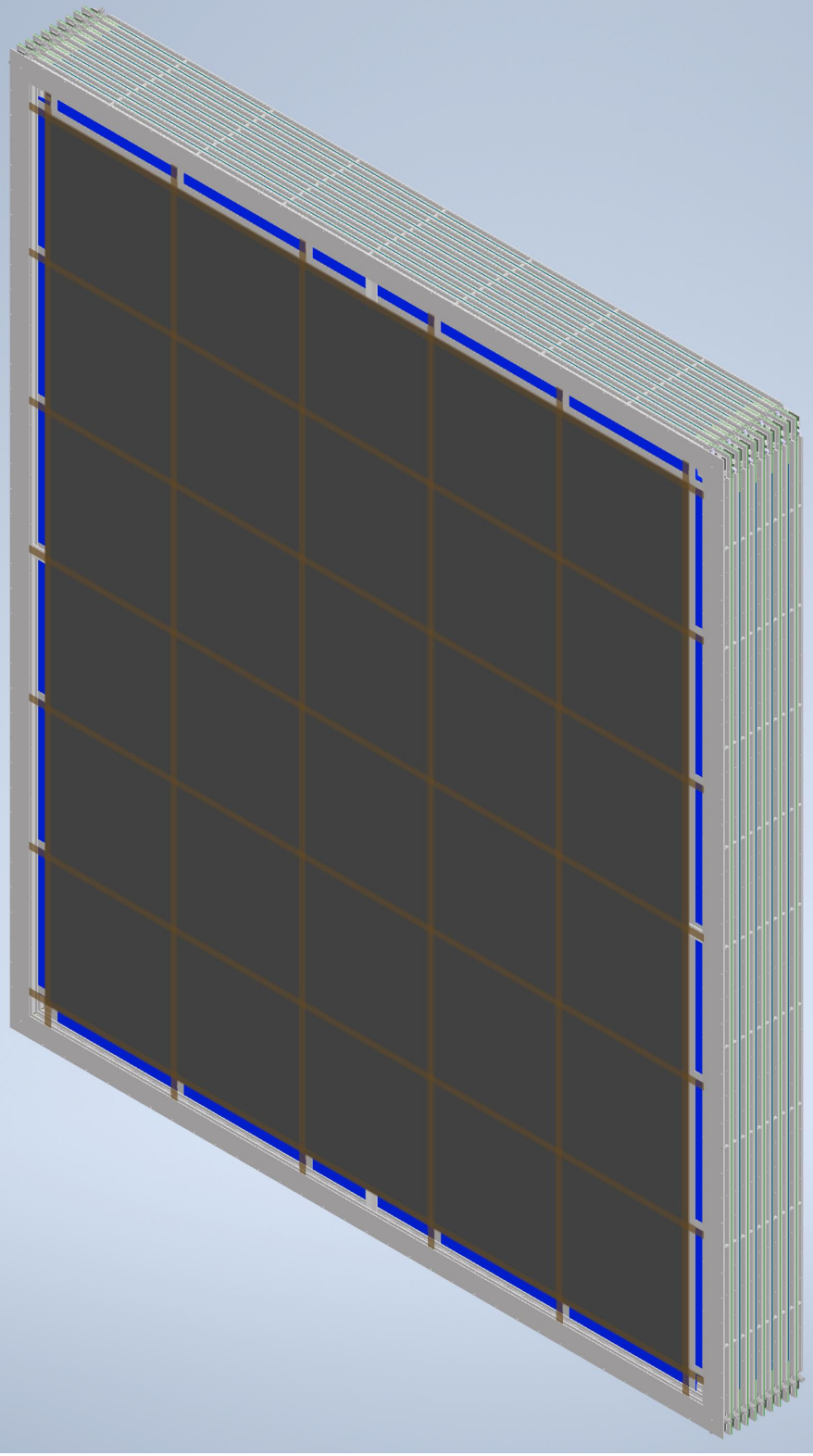
- *Locking mechanism with screwed Al rods on both sides of C-fiber frames (F. Raffaelli) can be tested with the 1.2m prototypes*

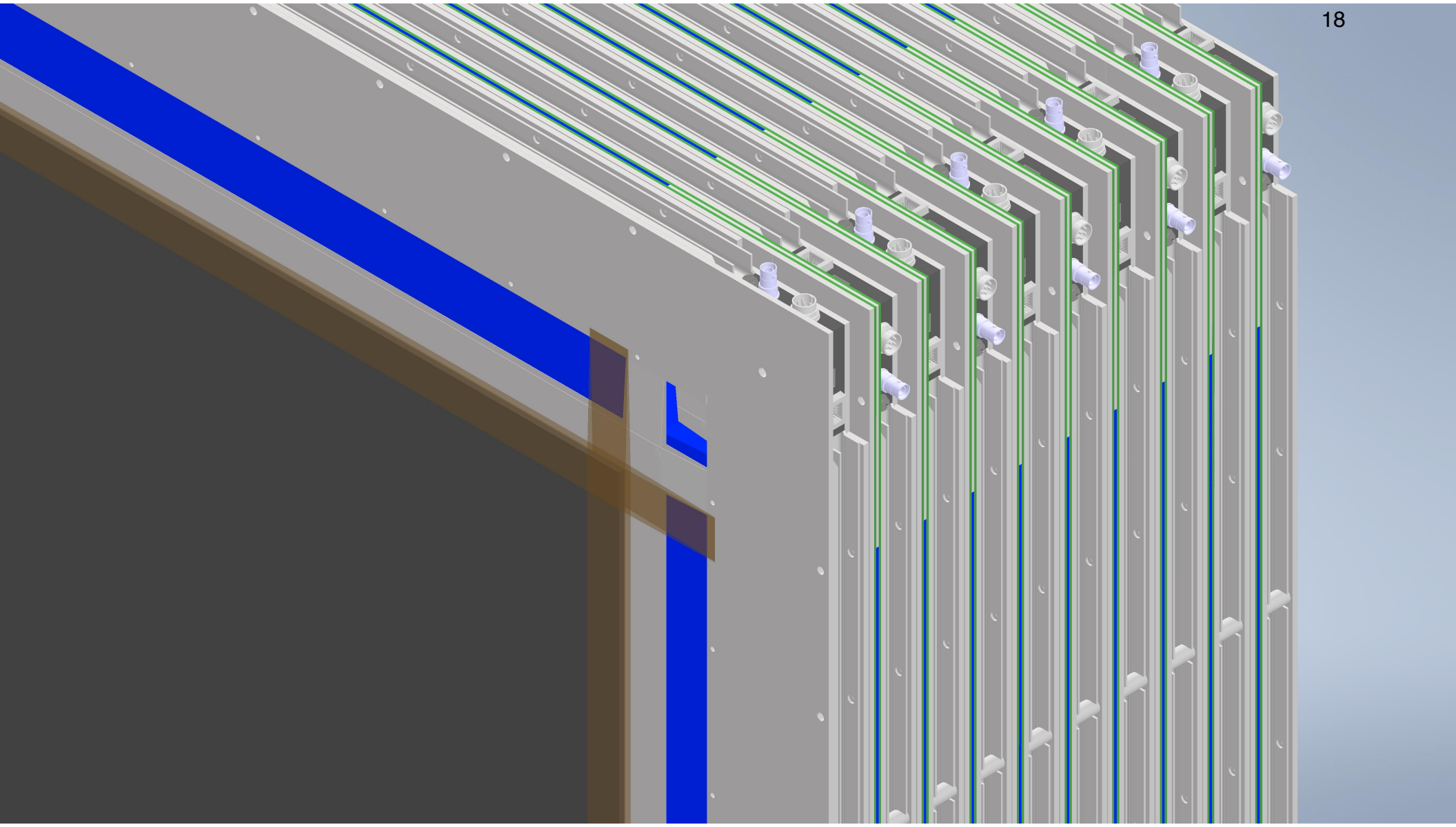
- *Flip readout location between even and odd tracking modules (left-right and up-down)*

  $\Longrightarrow$ *Improved track reconstruction and rejection of ghost tracks*

- *Super-module assembly basic STT unit to be considered for installation in the magnet*

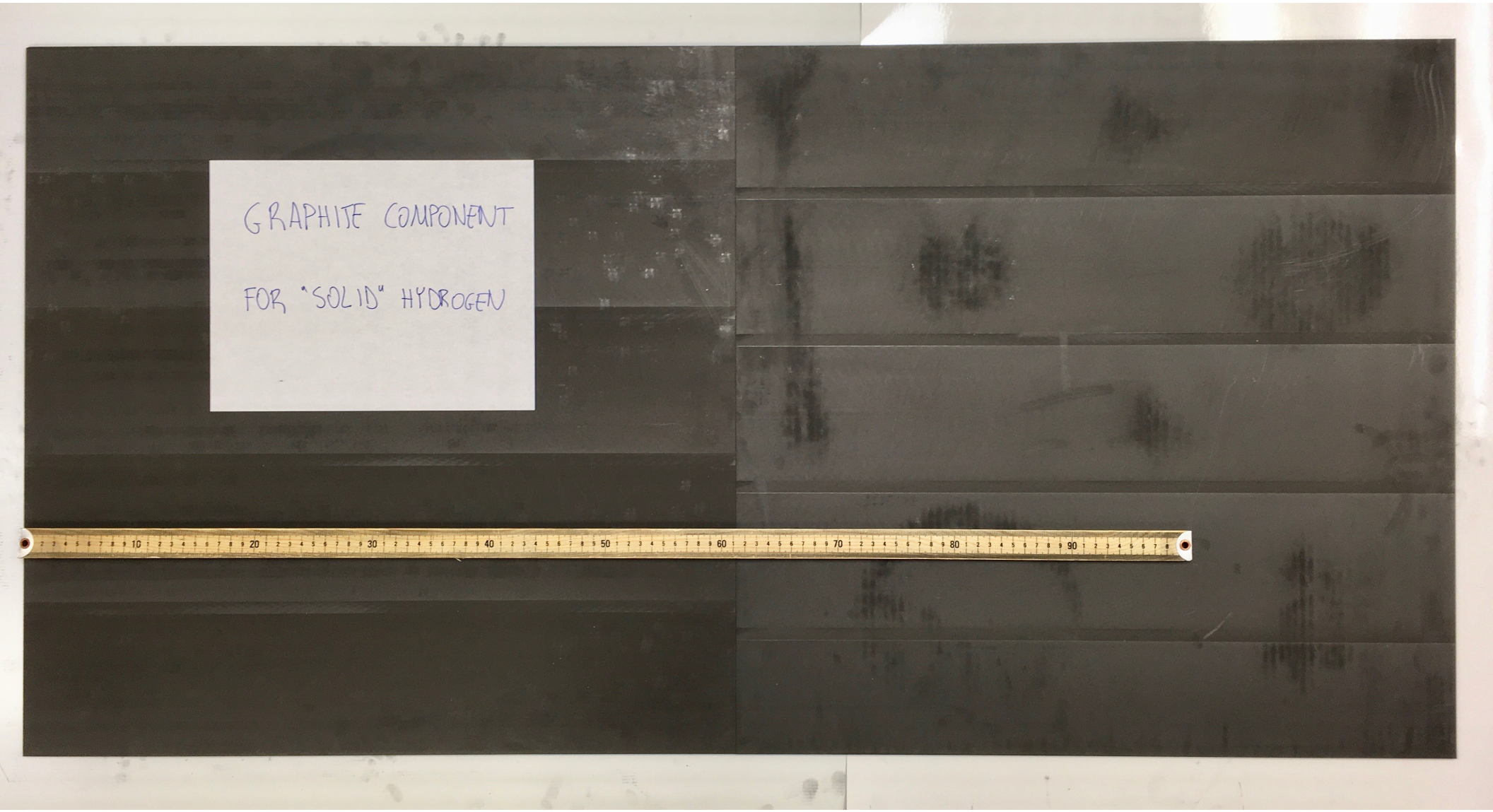
Super-module assembly
(4m × 3.3m) including
1 C + 9 CH_2 STT modules
clamped together
(total thickness 371 mm)





Details of a super-module assembly including 1 C target module and 9 CH_2 target modules

Backup slides



Prototype of graphite target tested at USC:
2 machined tiles 612mm x 612mm x 4mm (isotropic graphite, purity 100 ppm)