# Report from STT Working Group

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*SAND meeting*
*1 October 2024*

# OUTLINE



**Focus on progress since September CM:**

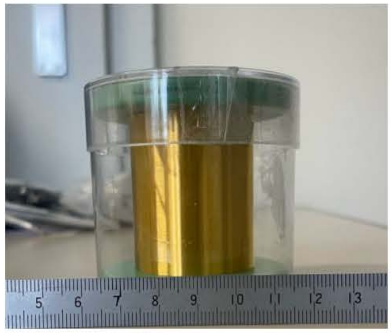
- *Tests of wire samples at CERN;*
- *Procurement of final pins, end-plugs, and spacers;*
- *Preparation for the assembly of C-fiber prototype in Pisa;*
- *Mechanical analysis and assembly of full-scale STT modules.*

*Material presented during WG meetings (Thursdays, 8:00am Central Time / US) available on Indico:*
`https://indico.fnal.gov/category/1402/`

# TESTS OF WIRE SAMPLES AT CERN

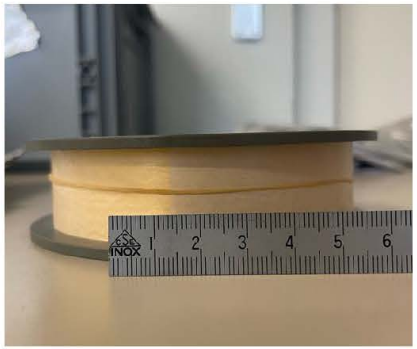
K. Buchanan (CERN)

## LUMA METALL

Tungsten-Rhenium wire LFJU860-003
Nom size 0.0020 mm
In **1.234**
Out **1.234**
Stored in wound holder and encased in noncontact plastic cover

## TOSHIBA

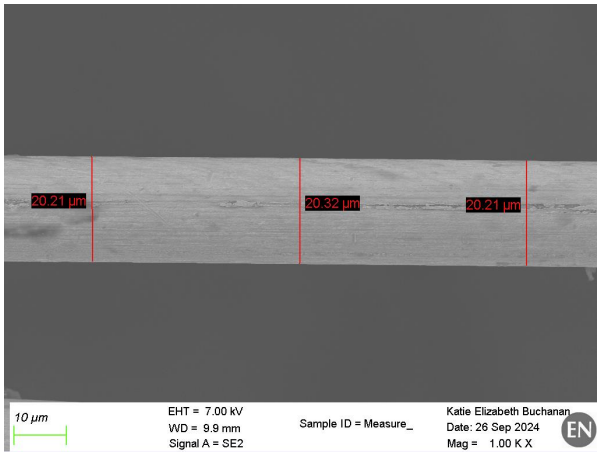


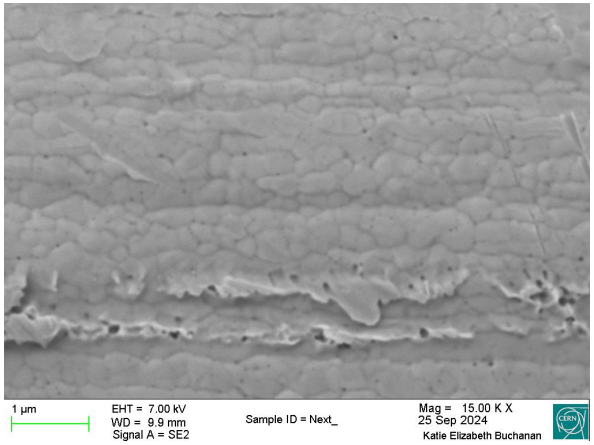
Tungsten-Rhenium wire HEX30ES
Lot 421D-3034 0.020M-CN
In **1.170**
Out **1.179**
Stored in metallic bag with silica beads, wound plastic holder and covered in a thin paper secured by rubber band.

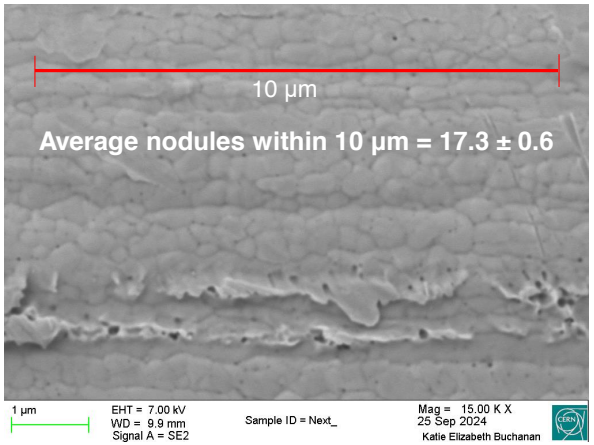
*LUMA wire used for 1.2m×0..8m CERN prototype and wiring tests of STT straws*
*Toshiba alternative supplier used in ATLAS TRT (pure tungsten)*

## Diameter and coating comparison

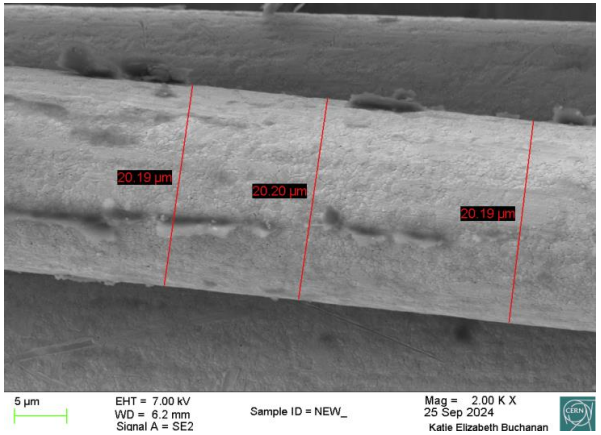
Luma

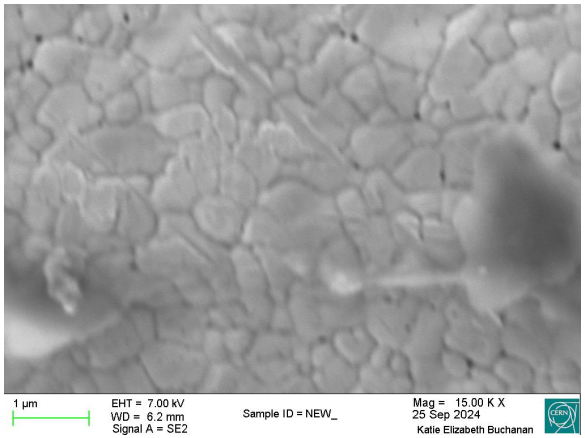


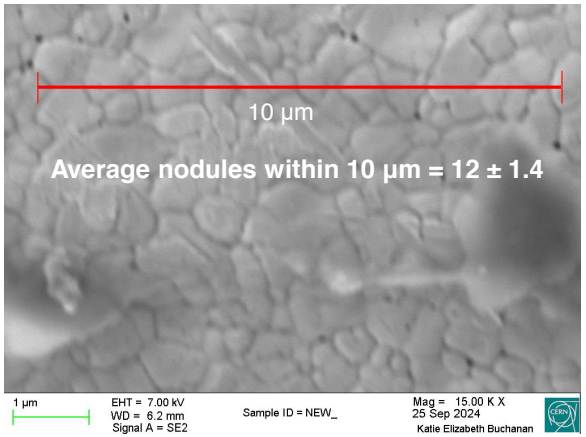




Toshiba



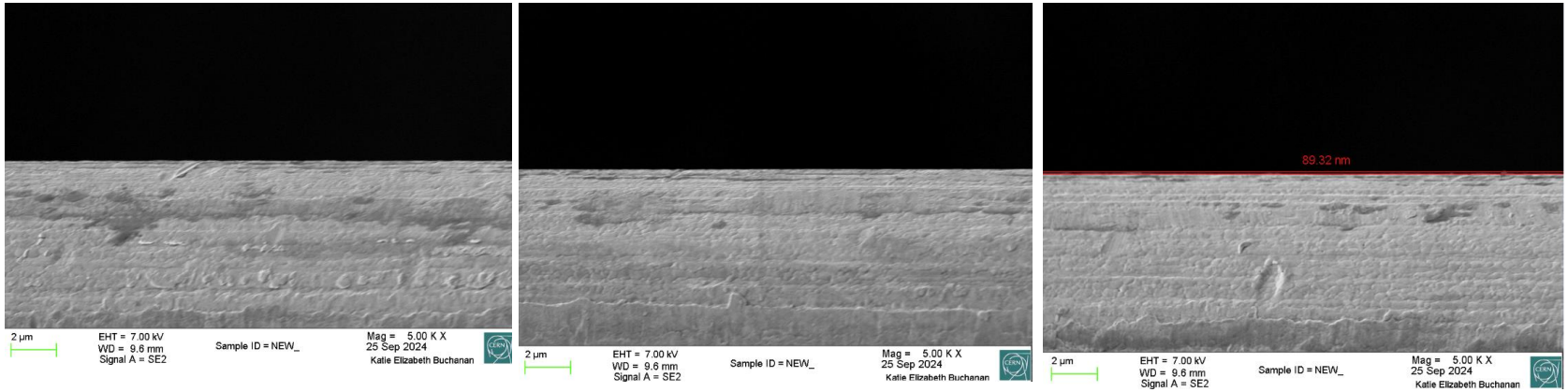




- *LUMA: average diameter 20.25 µm, homogeneous coating with impact marks noted*
- *Toshiba: average diameter 20.19 µm, homogenous coating, some organic deposits on surface (paper cover?)*

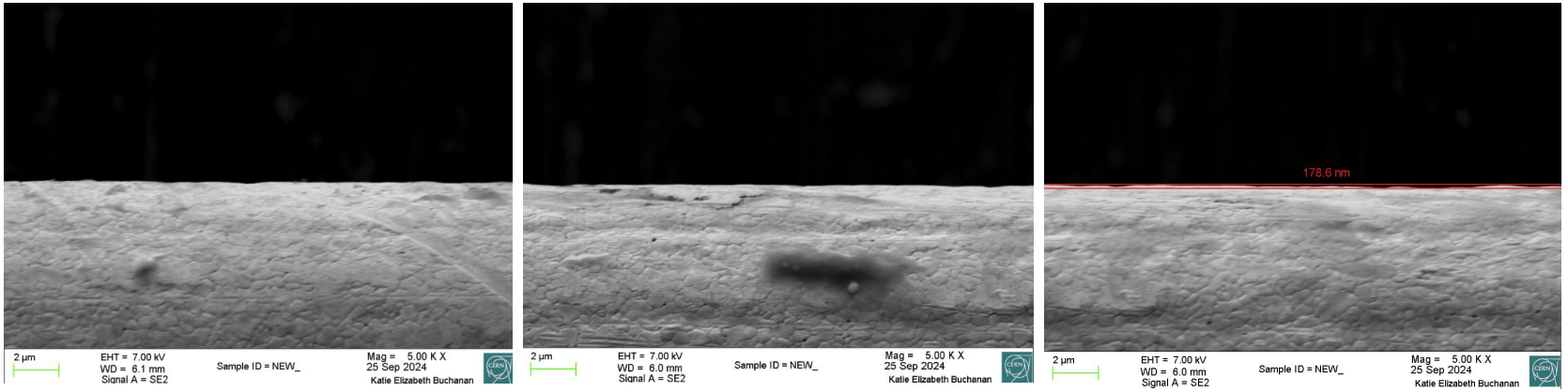
## Surface roughness comparison

LUMA




For LUMA, an average peak of around **89.0 nm** was measured on the SEM.

Toshiba




For Toshiba, an average peak of around **156.3 nm** was measured on the SEM.

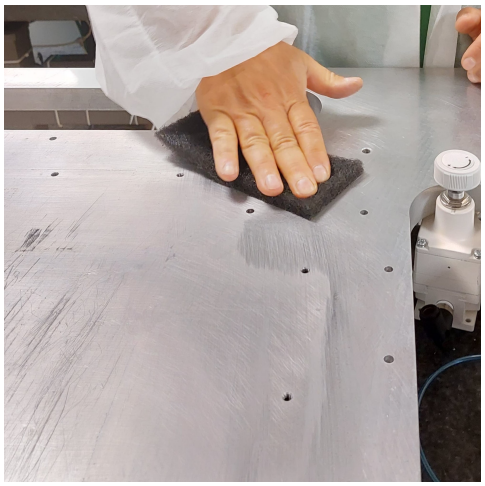
# PROCUREMENT OF PINS, ENDPLUGS & SPACERS

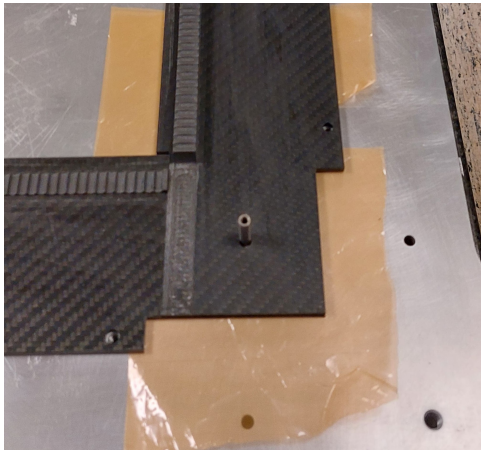


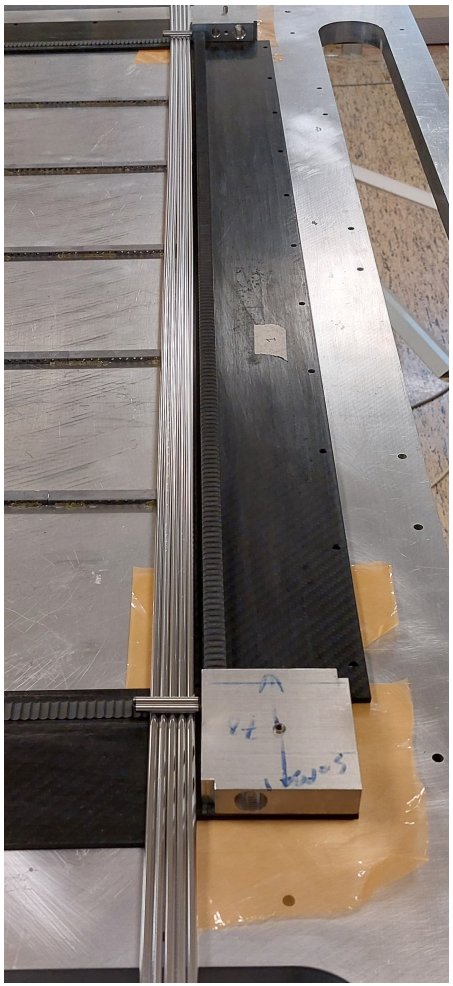
- *Final pins (10,000) and end-plugs produced by injection molding (10,000) received at CERN*
- *Final samples of spacers with reduced diameter of central hole received at CERN and being tested*

# PREPARATION FOR PROTOTYPE IN PISA

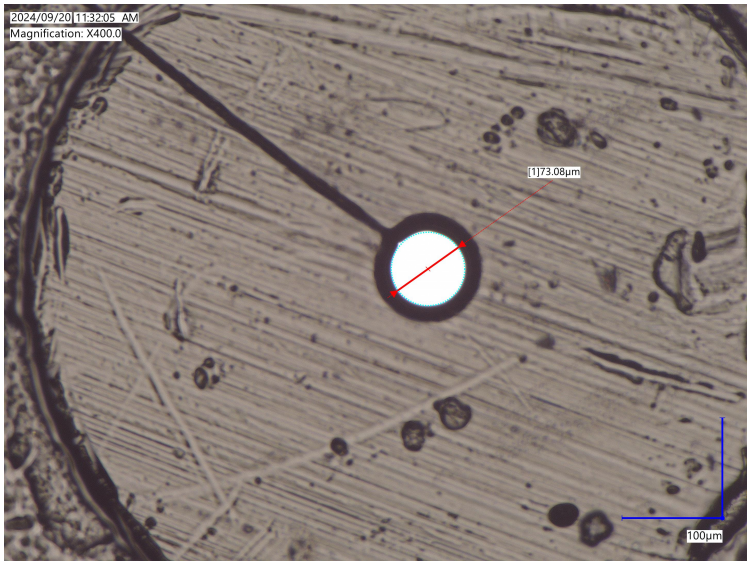


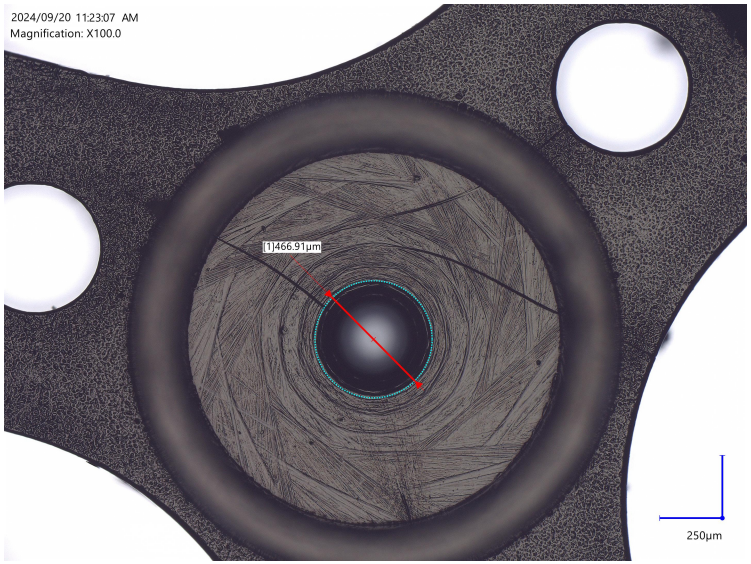




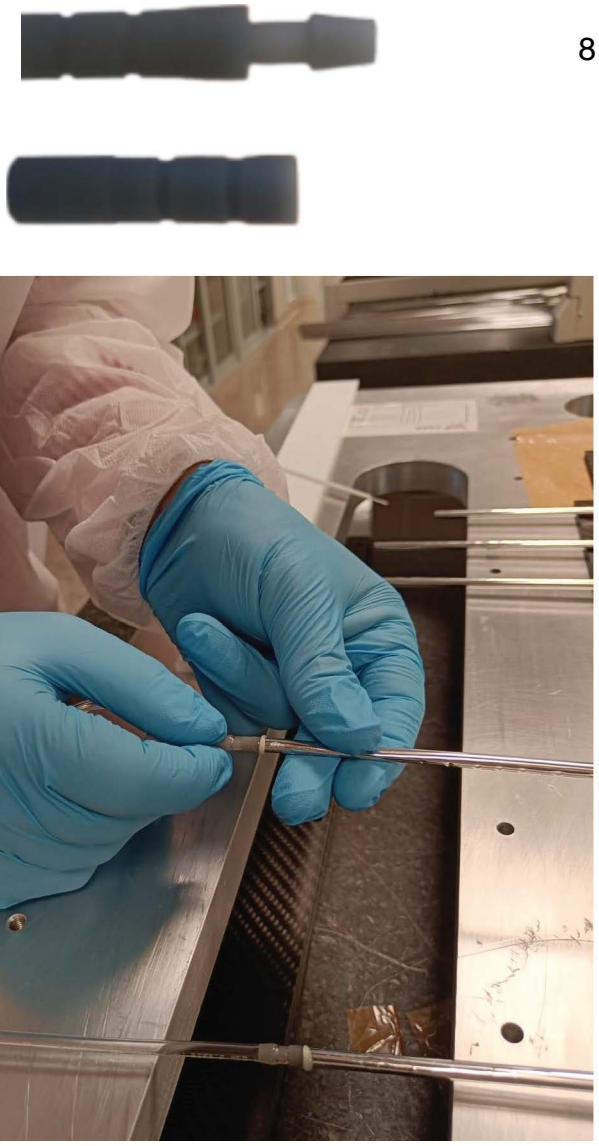


- *C-fiber frame 1.2m × 0.8m checked on the assembly table in the clean room;*
- *Improved planarity, fitting/consistency of parts, and sealing with respect to the CERN prototype;*
- *Next step gluing the bottom half of the frame and the corner blocks.*

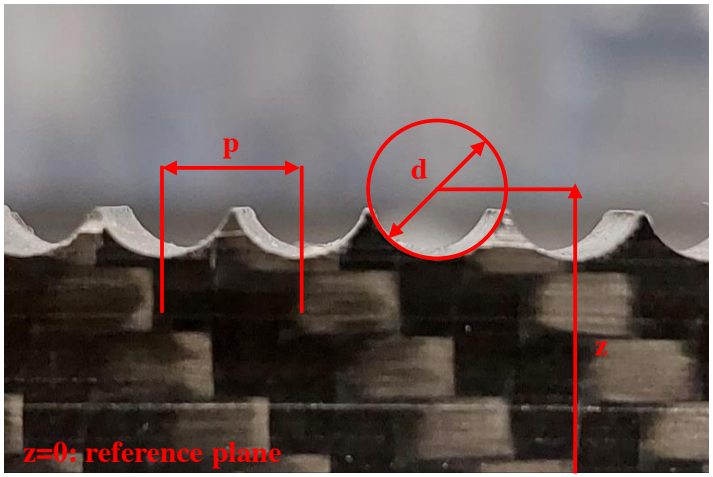


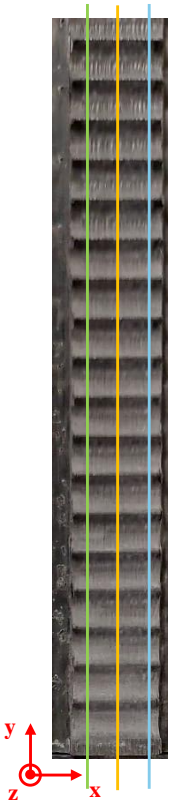

*Measured new spacer samples:*
*central hole diameter 70µm < d < 80µm*

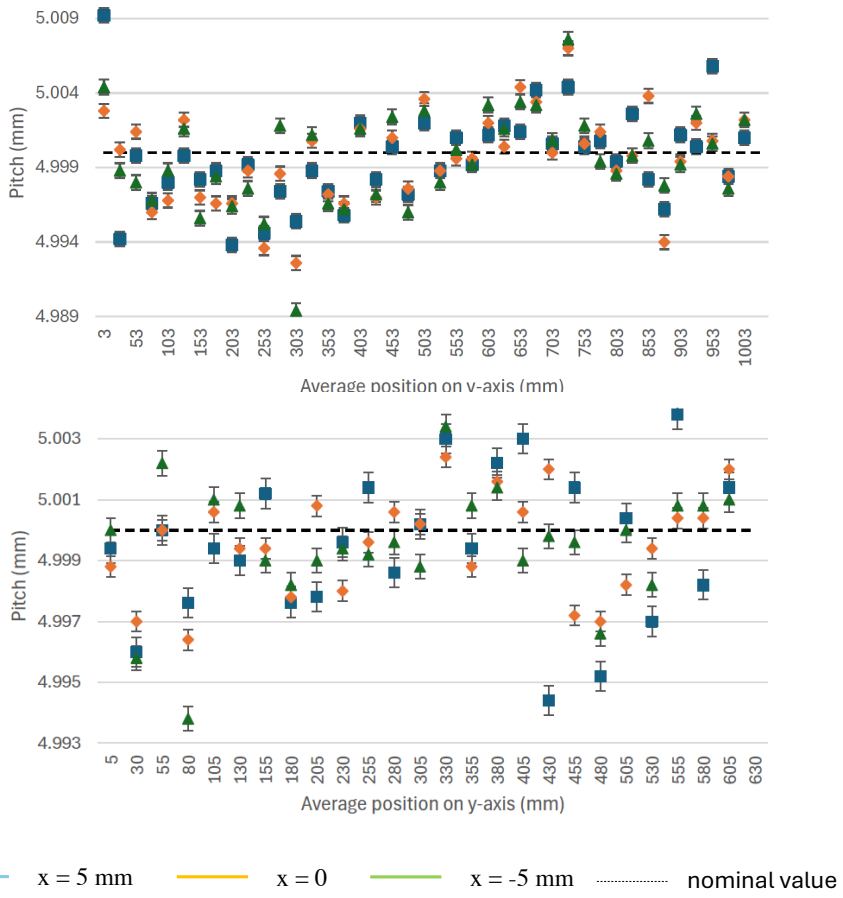


*Produced and tested temporary plugs*
*to terminate straws for pressurization*

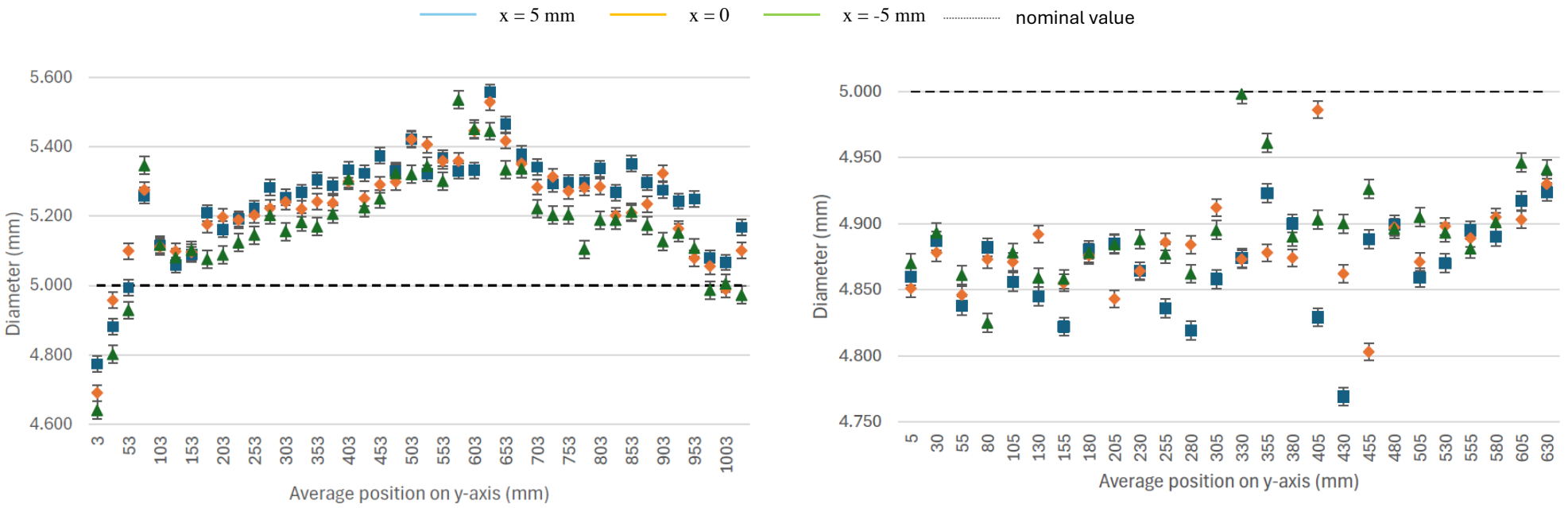



1. Place the component under a CMM
2. We measure pitch (p), diameter (d) and center height from reference plane (z) as function of the longitudinal coordinate (y)
3. Each measurement is repeated at three different x-coordinates: -5 mm, 0, 5 mm

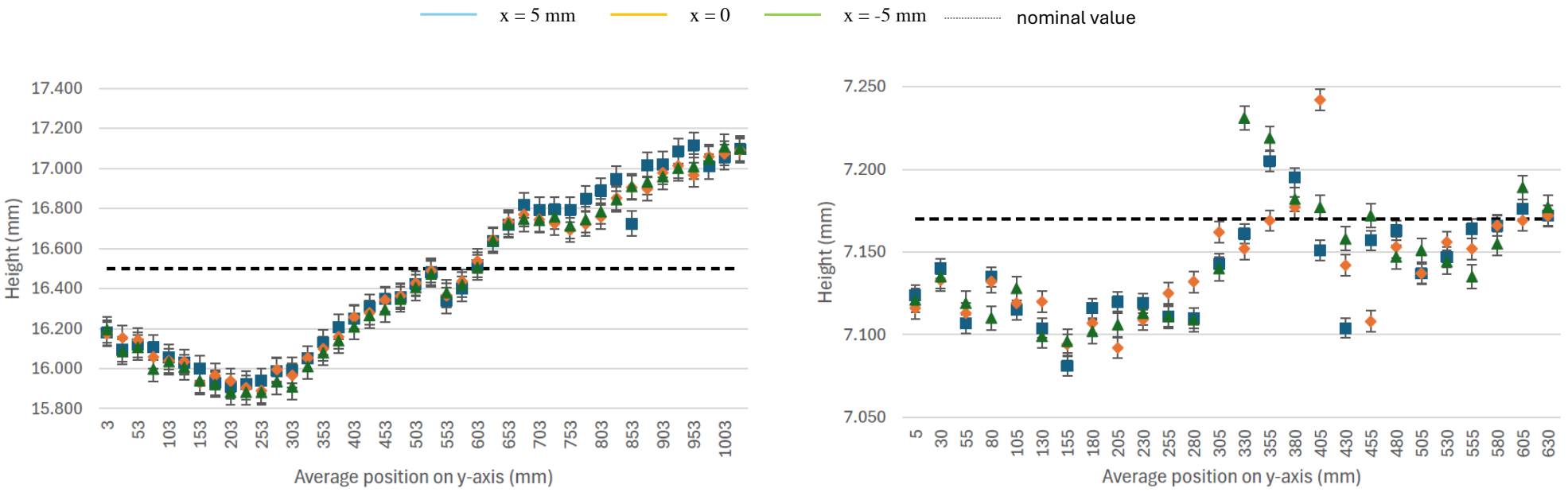



- *Measured again frame after small adjustments made by vendor in summer*
- *Pitch of the holes in the straw holder consistent with nominal within accuracy of CMM used*

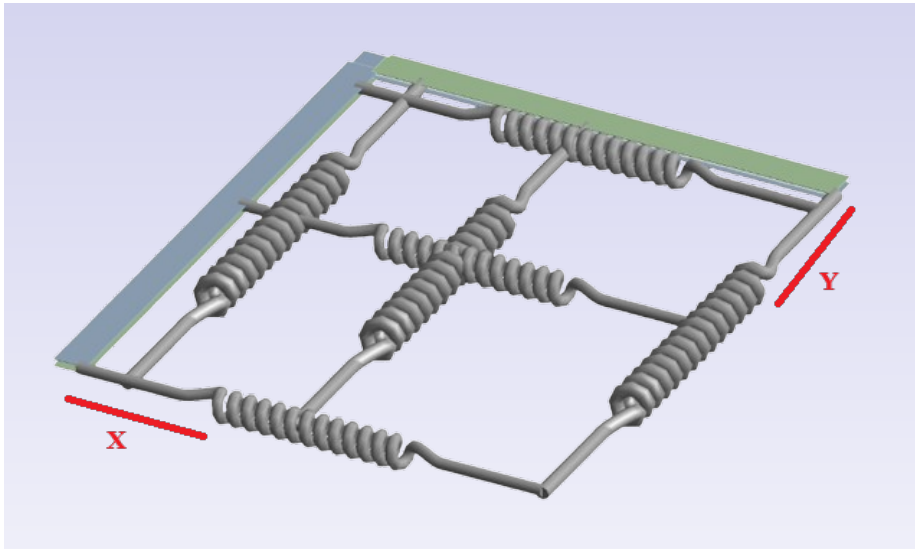


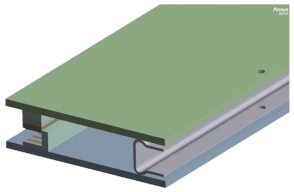

- *Hole diameter in the straw holder higher/lower than nominal for longer/shorter side elements;*
- *Adjustments done with sandpaper, Scotch-Brite, rat-tail files and final diameter checked with calibrated pins*




- *Measured height of the straw holder within 70 µm from nominal;*
- *Calibrated spacers will be used to improve the planarity of the straw holder on the assembly table.*

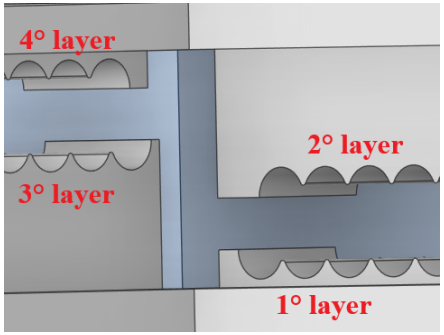
# ASSEMBLY OF FULL-SCALE MODULES



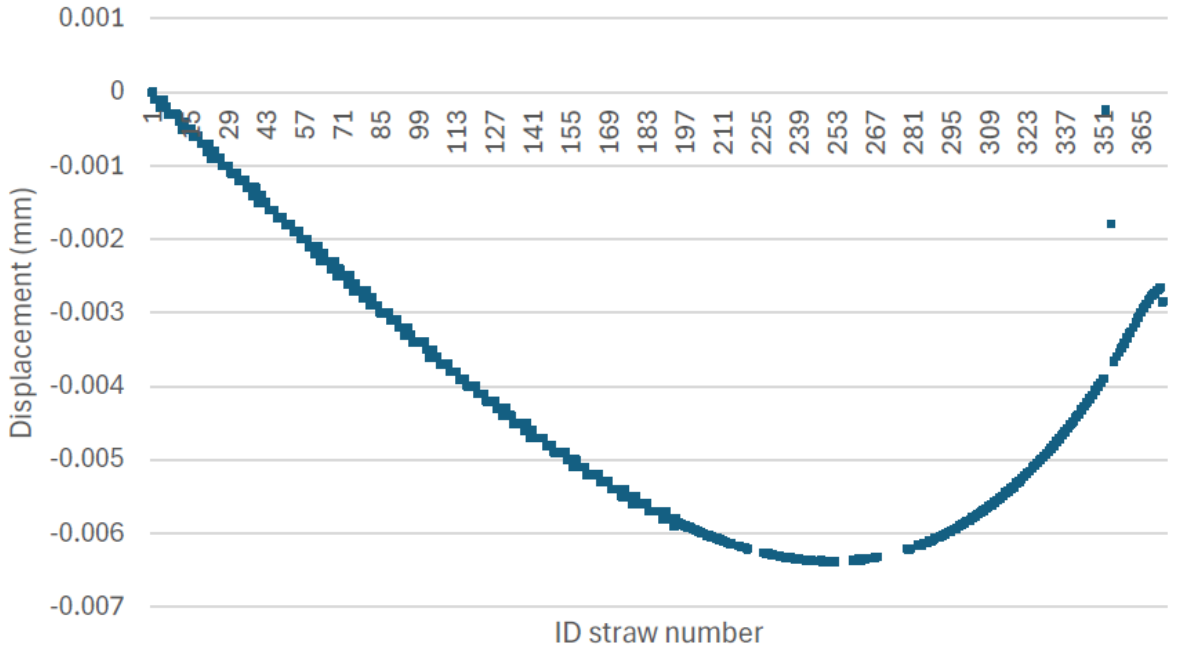
| Layer | Deformation (mm) | Limit (mm) |
|---|---|---|
| 1° | 2.75 | 3.69 |
| 2° | 2.75 | 3.69 |
| 3° | 3.25 | 3.09 |
| 4° | 3.25 | 3.09 |

Total deformations are the sum at both straw ends.
Long straws are 1° and 2° layer. Short straws are 3° and 4° layer




- *Mechanical analysis of full-scale module 4m×3.3m to finalize assembly procedure;*
- *Spring (rope) behavior of straws/wires: increased assembly pressure (tension pre-load) to 2.5 bar relative;*
- *Reduced maximal straw compression (3rd and 4th layers) to 80 µm per side.*

$\Longrightarrow$ *The C-fiber frame does not present risks regarding mechanical strength*




*Relative displacement between nearby straws ($n$ and $n+1$)*
*due to frame deformation found to be less than 7 μm per frame side*

# Backup slides