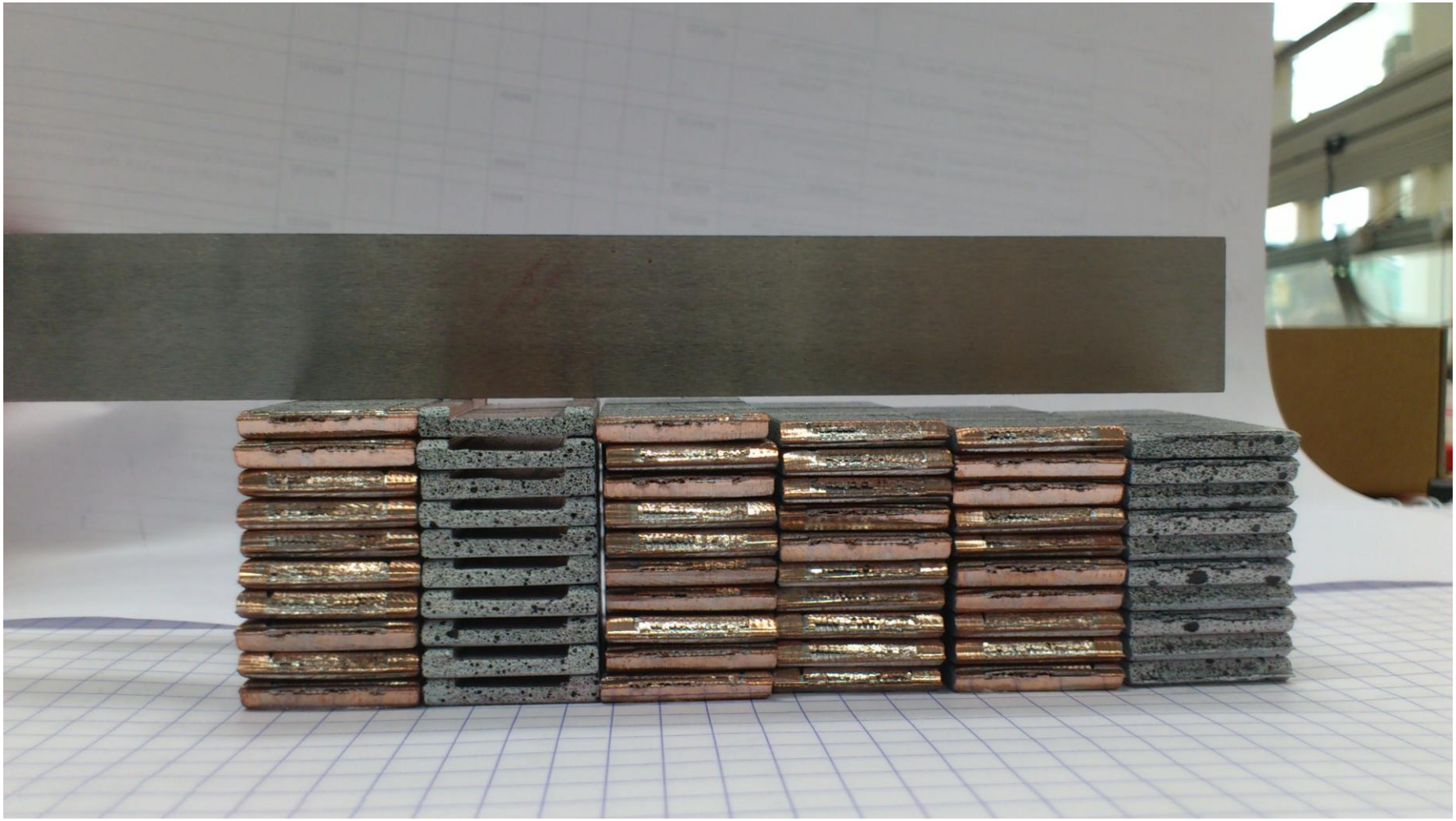
Conductor Mechanical Testing – 25 June 2012

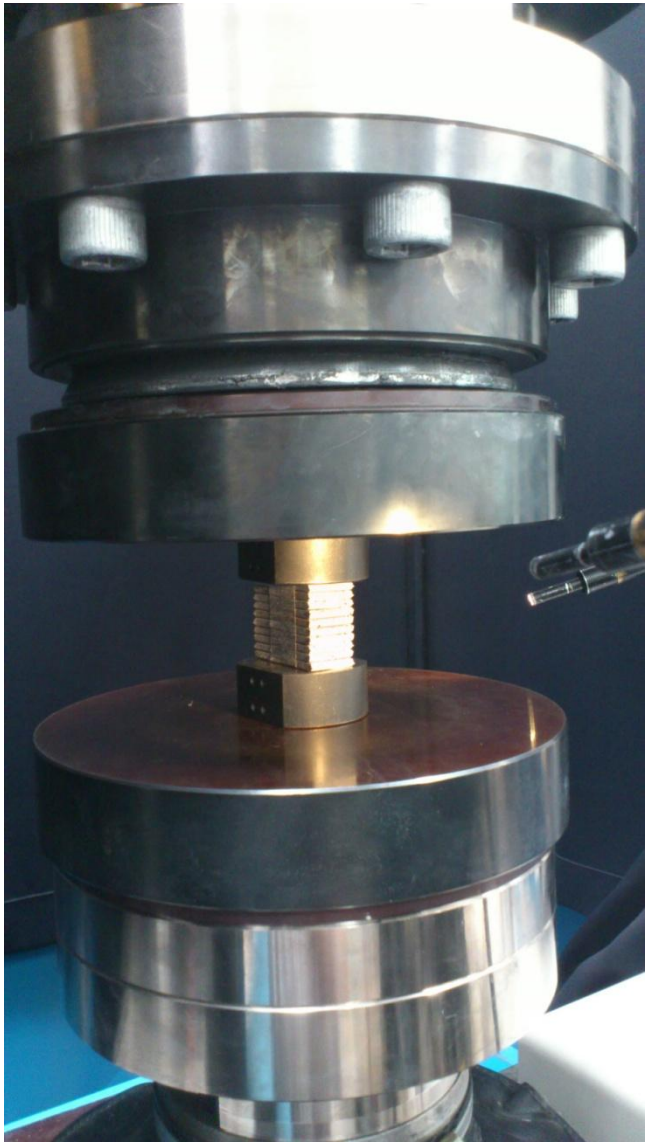
Sample reference	Description	Test
4.11	Straight part cut from AES spool - Stack of 10 conductors length 40 mm	Compression test with Aramis camera
4.41	Straight part cut from AES spool length 1 meter+ pre compression with wedges 3,10 mm - Stack of 10 conductors length 40 mm	Compression test with Aramis camera
4.51	Straight part cut from AES spool length 1 meter+ pre compression with wedges 3,00 mm - Stack of 10 conductors length 40 mm	Compression test with Aramis camera
4.61	Straight part cut from AES spool length 1 meter+ pre compression with wedges 2,90 mm - Stack of 10 conductors length 40 mm	Compression test with Aramis camera
4.71	Straight part cut from AES spool length 1 meter+ pre compression with wedges 2,80 mm - Stack of 10 conductors length 40 mm	Compression test with Aramis camera

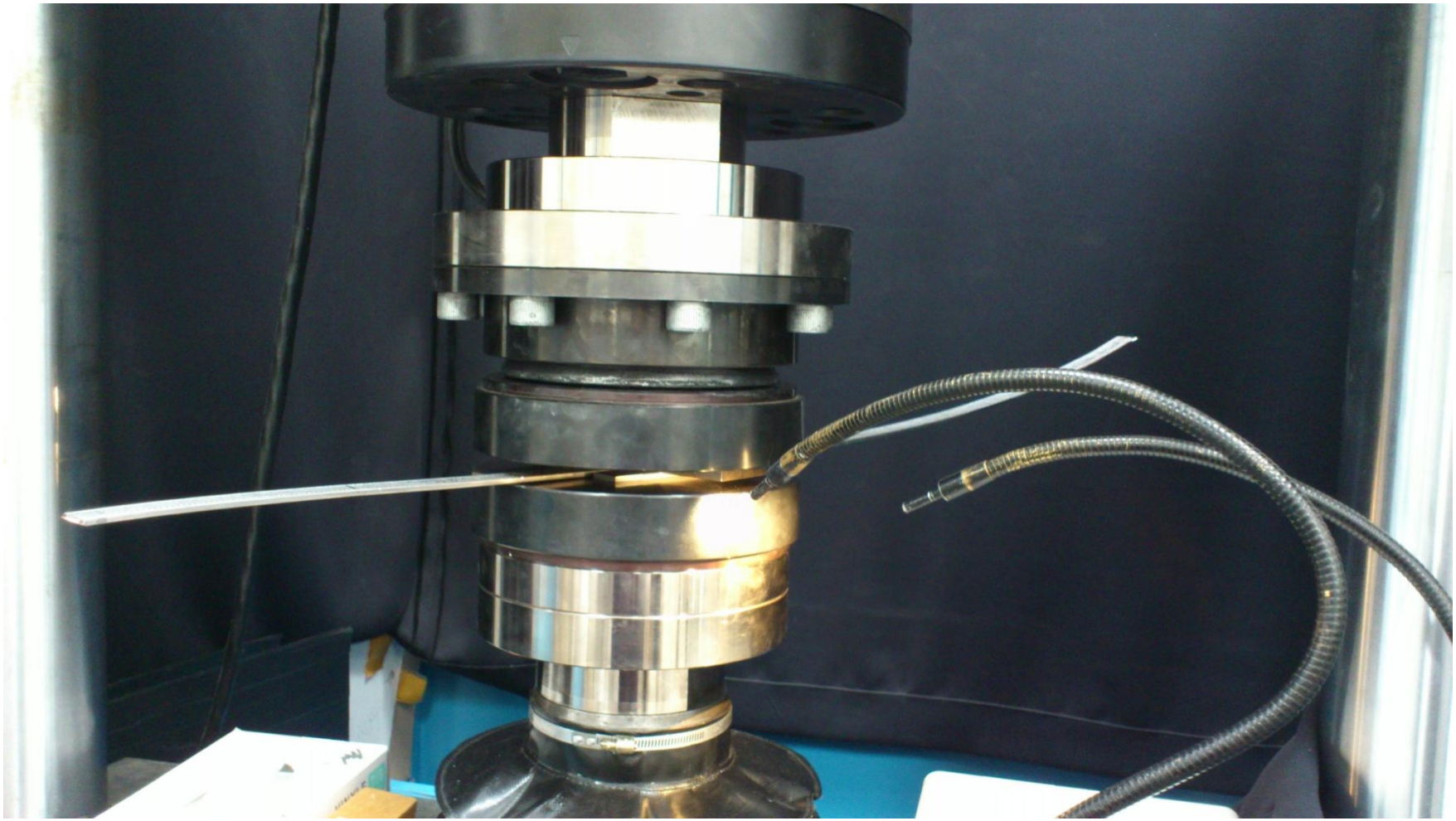

4,41
4,51
4,61
4,71

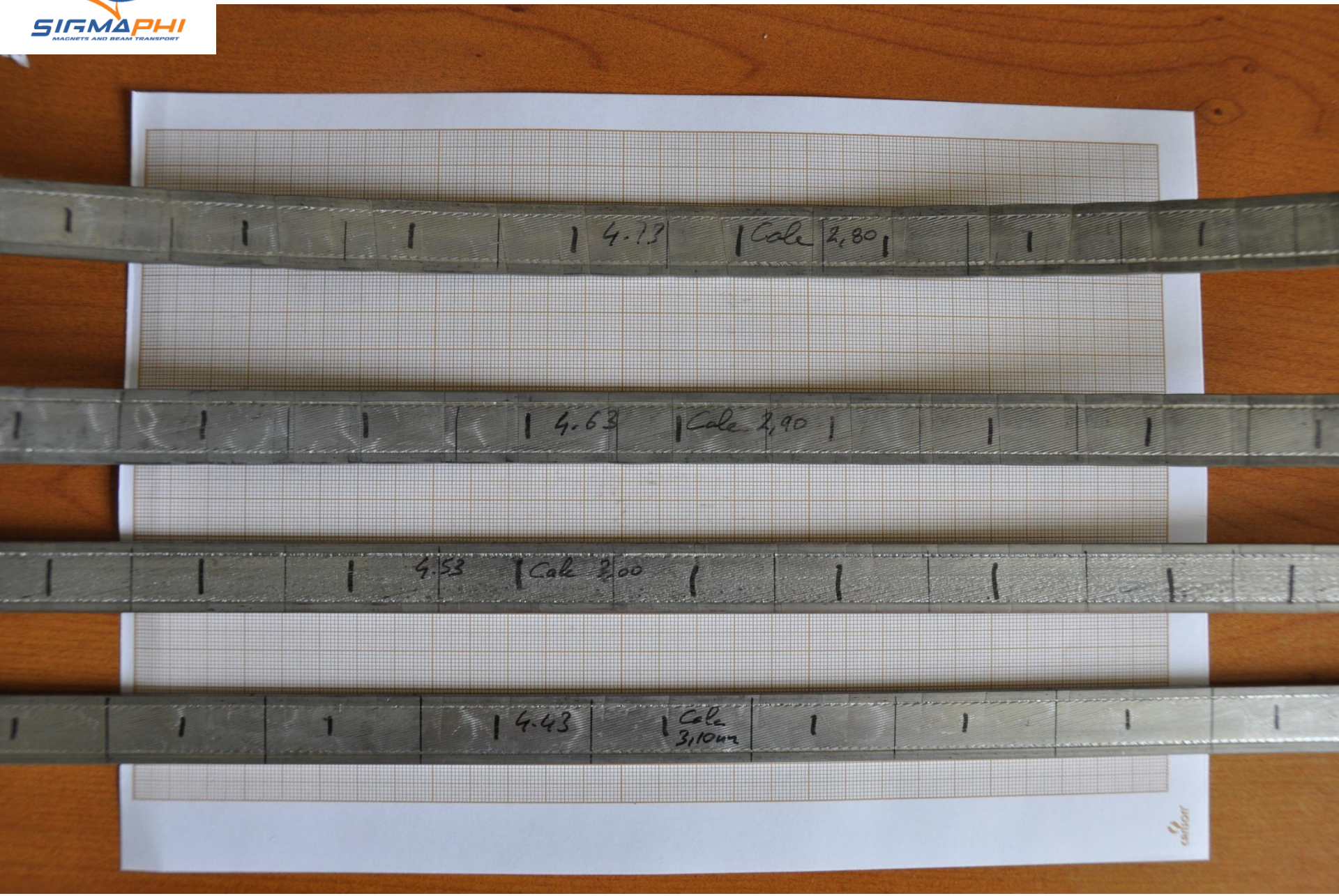
STACKS BEFORE COMPRESSION TEST

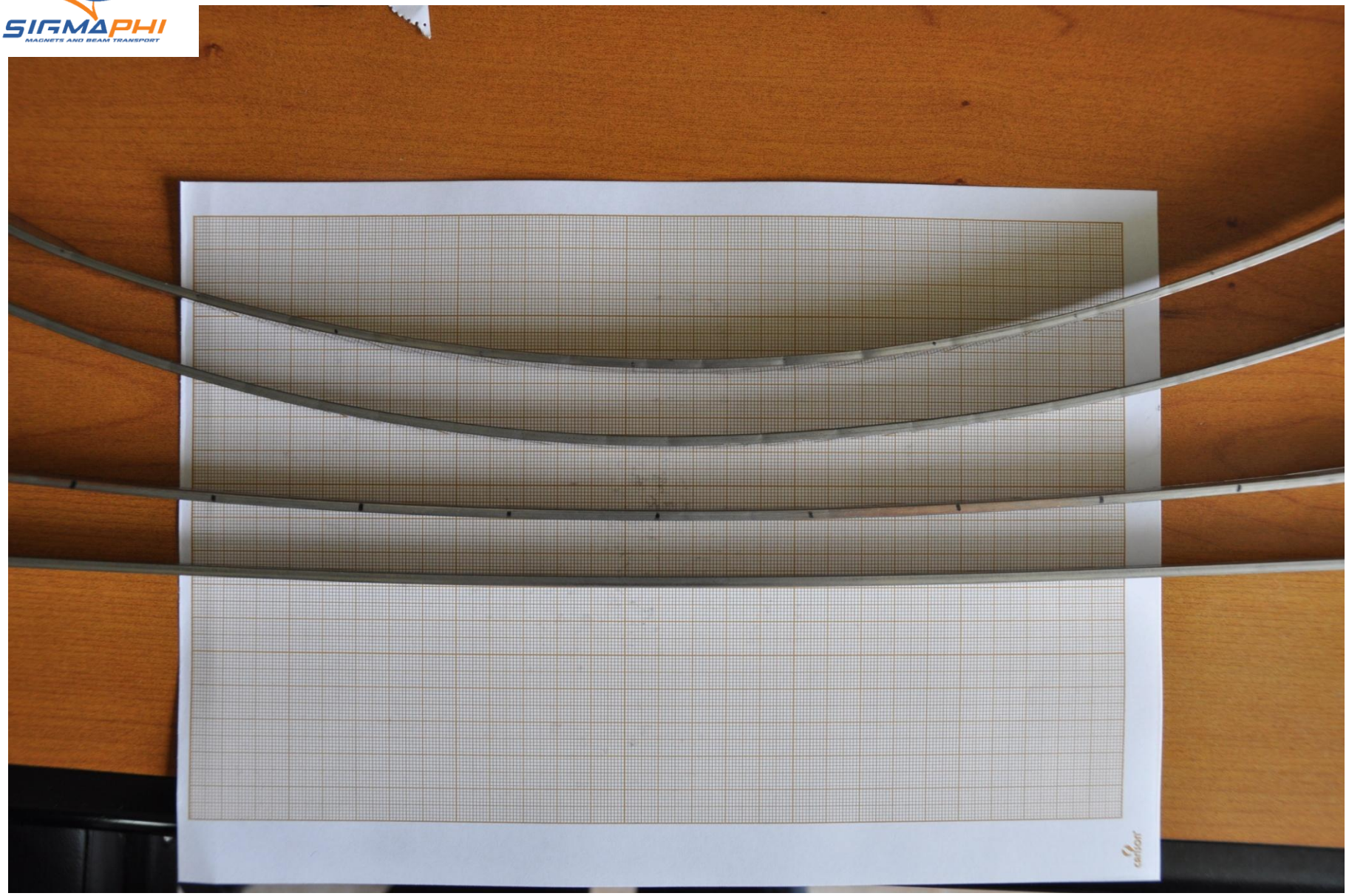
STACKS BEFORE COMPRESSION TEST



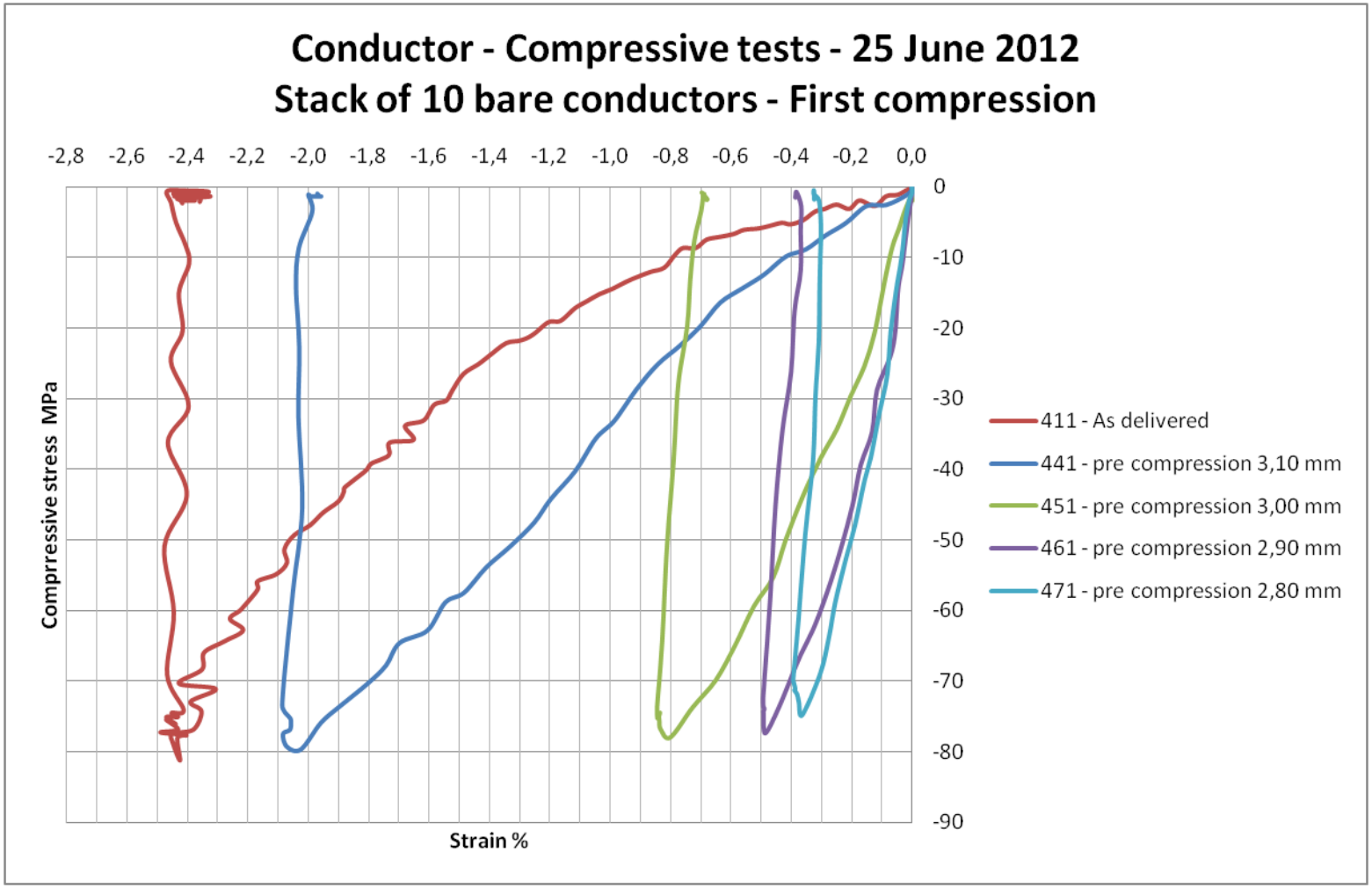


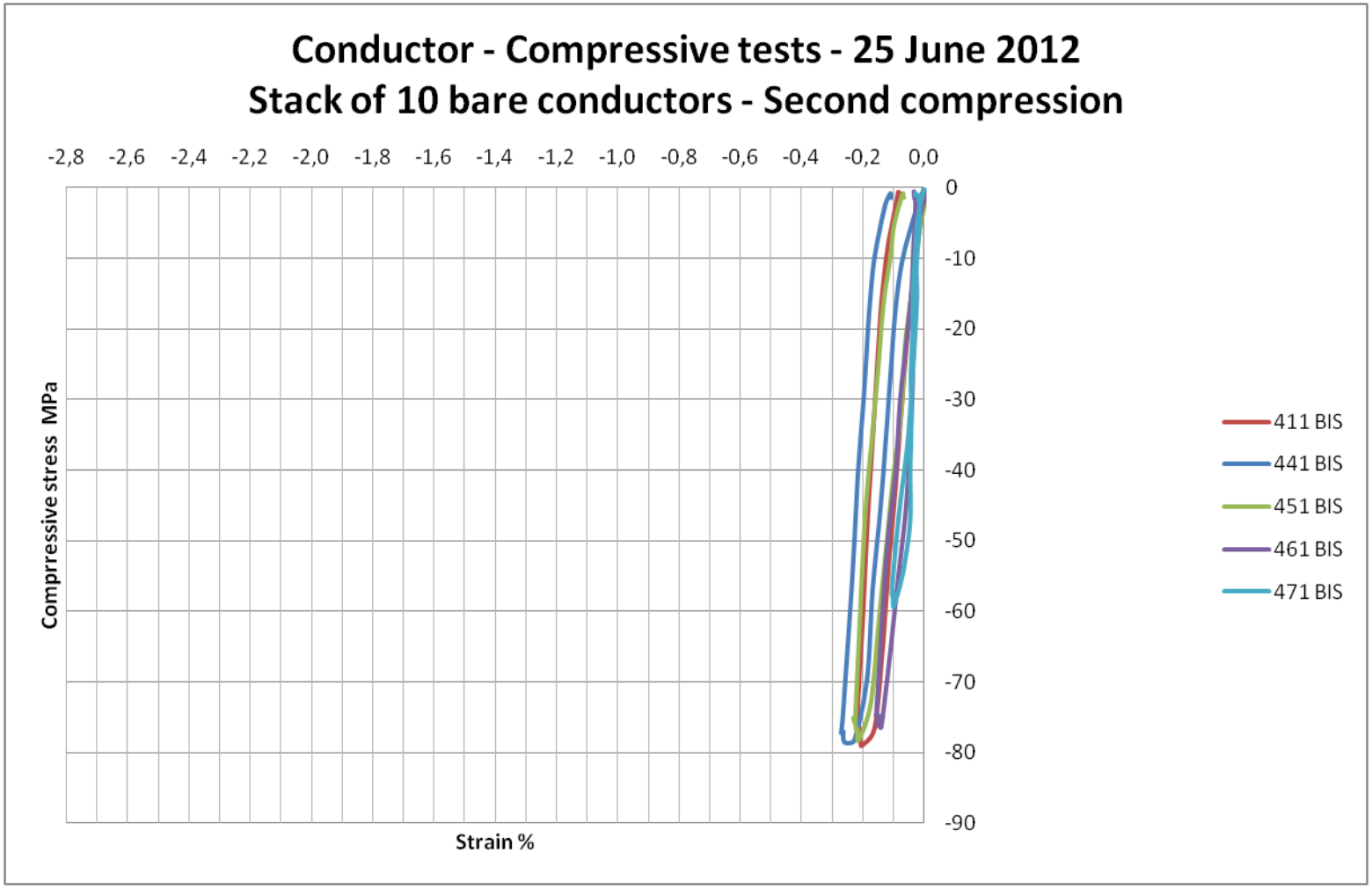


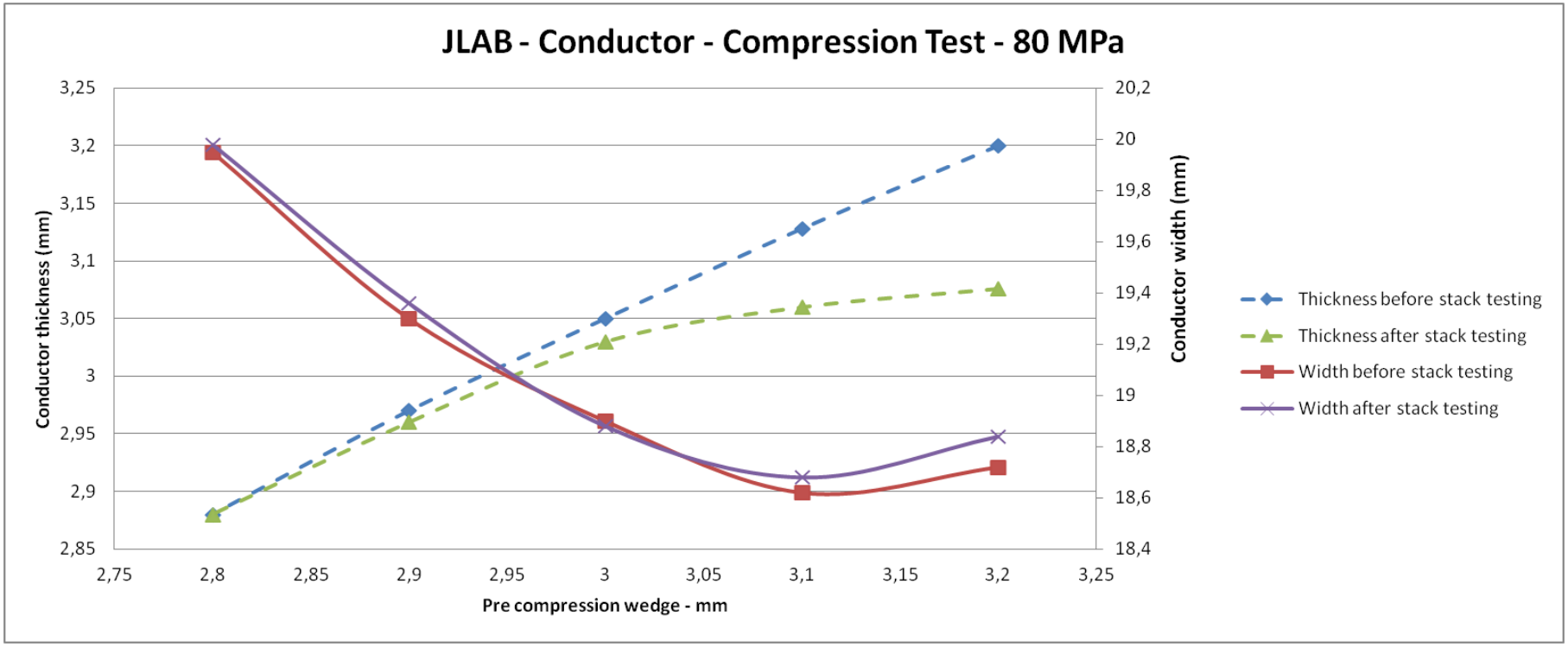

4.73
Cale 2,80
4.63
Cale 2,90
4.53
Cale 3,00
4.43
Cale 3,10mm




4.63
Cale. 2,90


Conductor - Compressive tests - 25 June 2012
Stack of 10 bare conductors - First compression
-2,8 -2,6 -2,4 -2,2 -2,0 -1,8 -1,6 -1,4 -1,2 -1,0 -0,8 -0,6 -0,4 -0,2 0,0
0 -10 -20 -30 -40 -50 -60 -70 -80 -90
Comprressive stress MPa
Strain %
411 - As delivered
441 - pre compression 3,10 mm
451 - pre compression 3,00 mm
461 - pre compression 2,90 mm
471 - pre compression 2,80 mm


Conductor - Compressive tests - 25 June 2012
Stack of 10 bare conductors - Second compression
-2,8 -2,6 -2,4 -2,2 -2,0 -1,8 -1,6 -1,4 -1,2 -1,0 -0,8 -0,6 -0,4 -0,2 0,0
0 -10 -20 -30 -40 -50 -60 -70 -80 -90
Comprressive stress MPa
Strain %
411 BIS
441 BIS
451 BIS
461 BIS
471 BIS


JLAB - Conductor - Compression Test - 80 MPa
Conductor thickness (mm)
3,25
3,2
3,15
3,1
3,05
3
2,95
2,9
2,85
Conductor width (mm)
20,2
20
19,8
19,6
19,4
19,2
19
18,8
18,6
18,4
2,75
2,8
2,85
2,9
2,95
3
3,05
3,1
3,15
3,2
3,25
Pre compression wedge - mm
Thickness before stack testing
Thickness after stack testing
Width before stack testing
Width after stack testing

Preliminary comments:

1) The conductors stack stiffness is greatly improved after a conductor pre compression at 2,90 mm compared to the nominal thickness 3,2 mm. The FEA model shall demonstrate this is enough to guarantee the coil collaring and reliability.

2) The conductor pre compression process yields a curvature and width variation which are difficult to manage for the winding line. Therefore the pre compression process requires significant improvement to be validated for manufacturing. A specific equipment must also be designed and manufactured to modify the conductor.

3) The conductor modification may last several months before full completion and requires a new contract agreement between JLAB and Sigmaphi.