

Bottom connection and splice at corner pieces

PH-DT Engineering Office, CERN

CERN, May 11th 2015

Status today

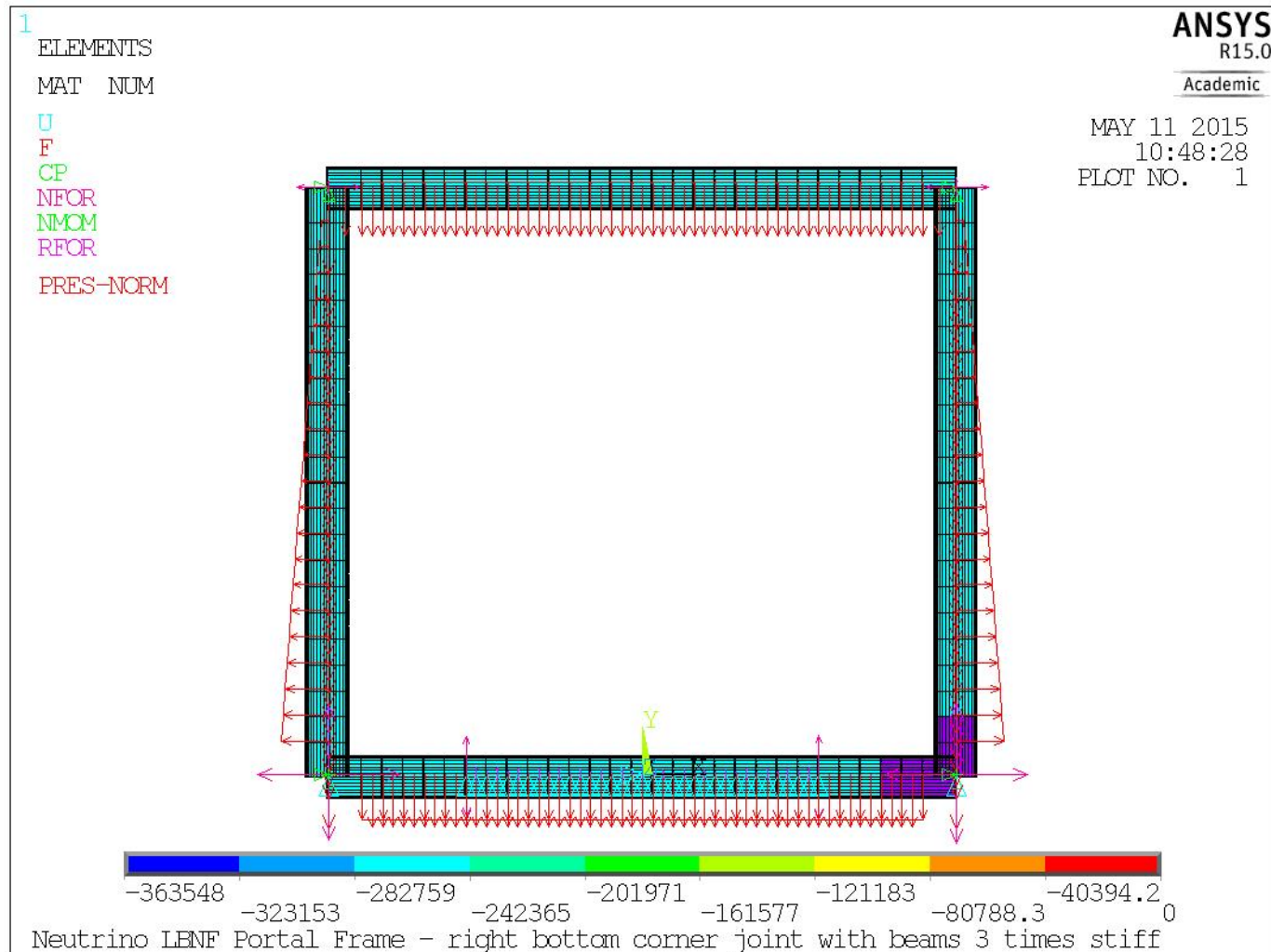
- Bolted connection at bottom – capacity likely to decrease: calculating new joint with rows of two bolts
- Splice position and size of corner piece: studies ongoing
- Short side walls: analyses yet to be done
 - longitudinal force retaining system, bracings
 - Pinned or M connection at top
 - M connection at bottom
- Behaviour of bottom elements (floor): yet to be optimised
- Buckling final results and bracings: add bracing, ignore grid
- Understanding requirements $P_m + P_b < 1.5 S$ for div 1 and div 2
- Interpretation of bolt stresses according to ASME (?)

- Seismic calculations (no time for the review)

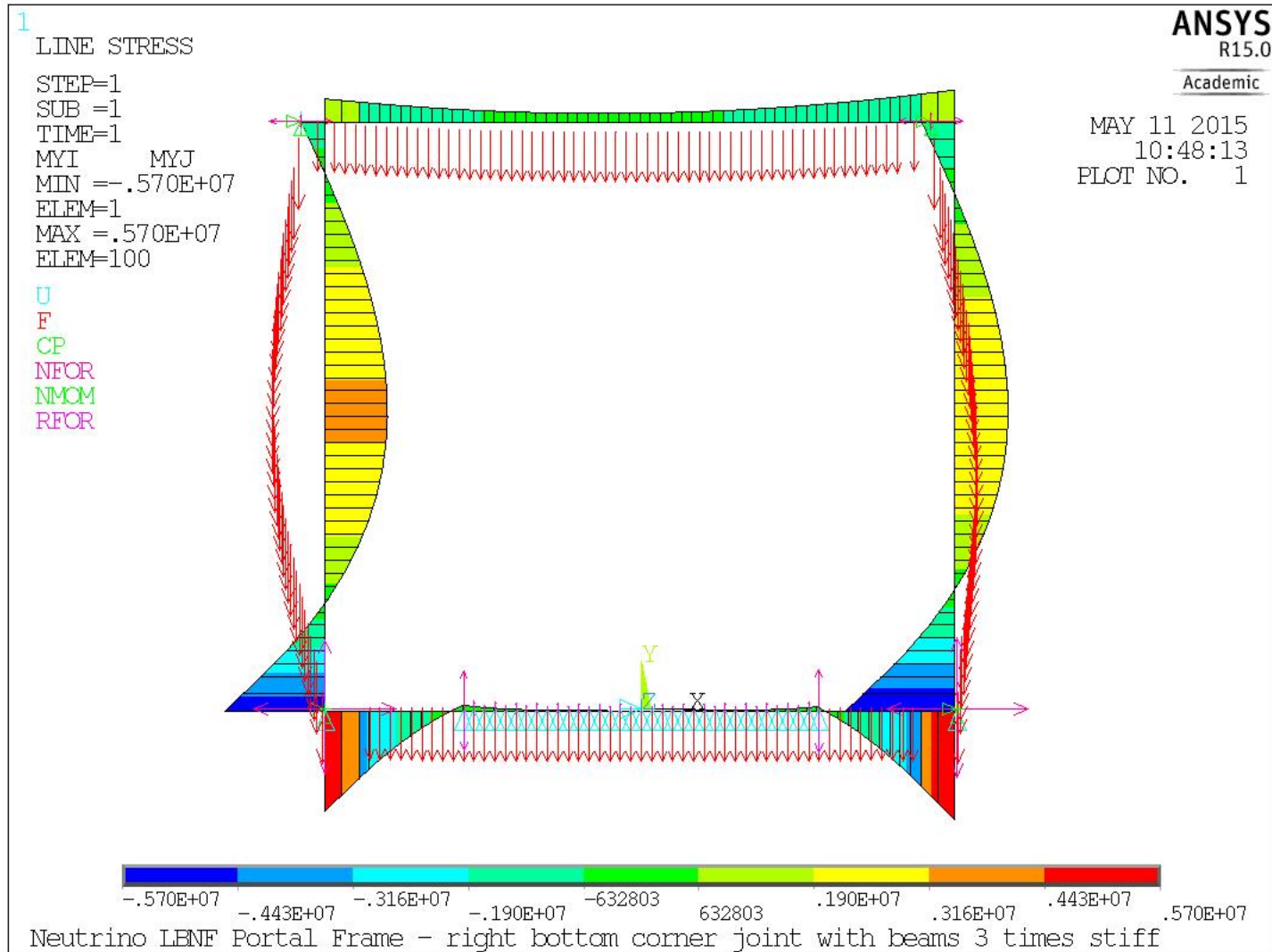
- Material x the review (8 working days left, some people absent)

Static analysis results – corner piece

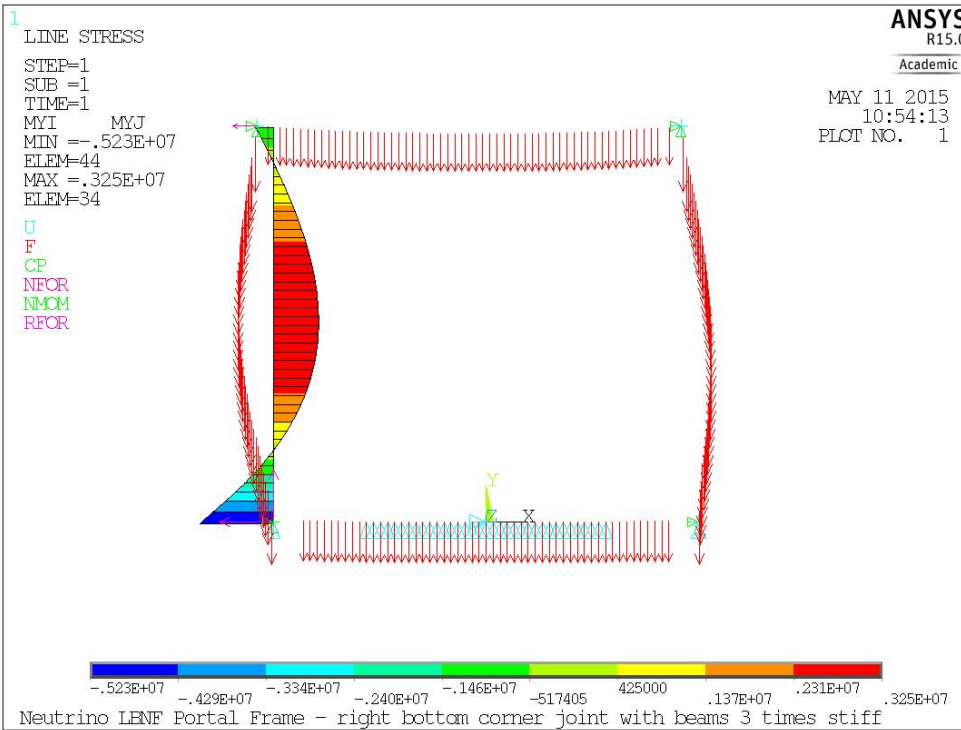
- Scope: analysis moment inversion point and dispersion vs corner stiffness:
- HL1100-548: beam
- Corner solid piece (3 times stiffer)



Static analysis results – corner piece

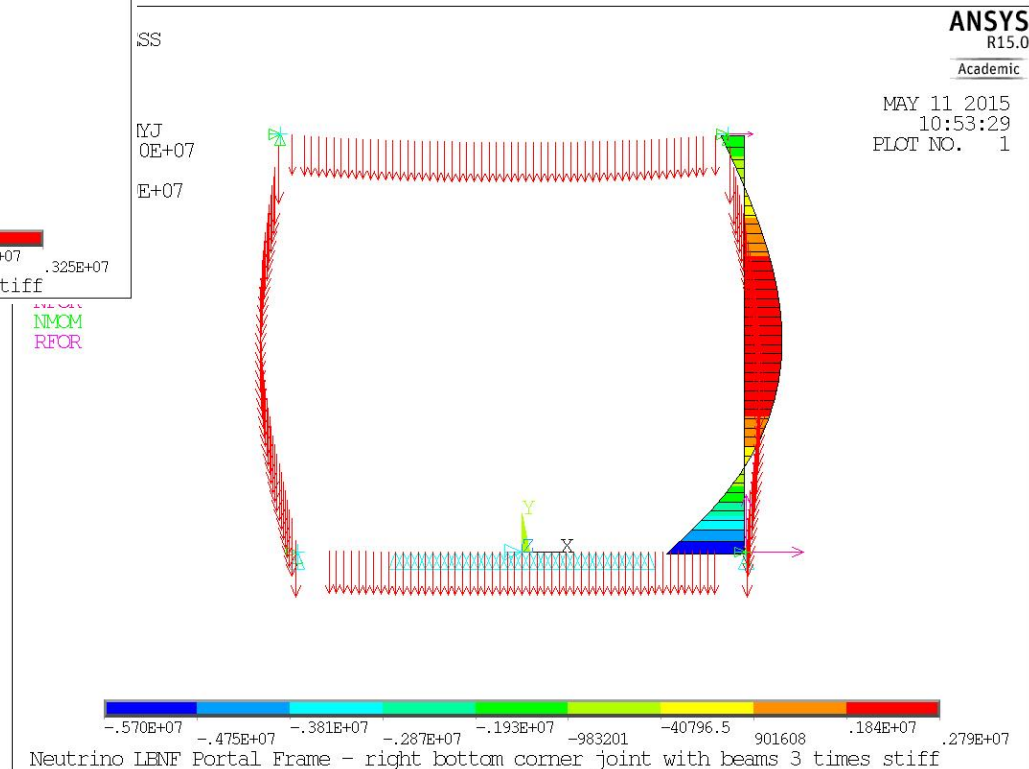


Static analysis results – corner piece

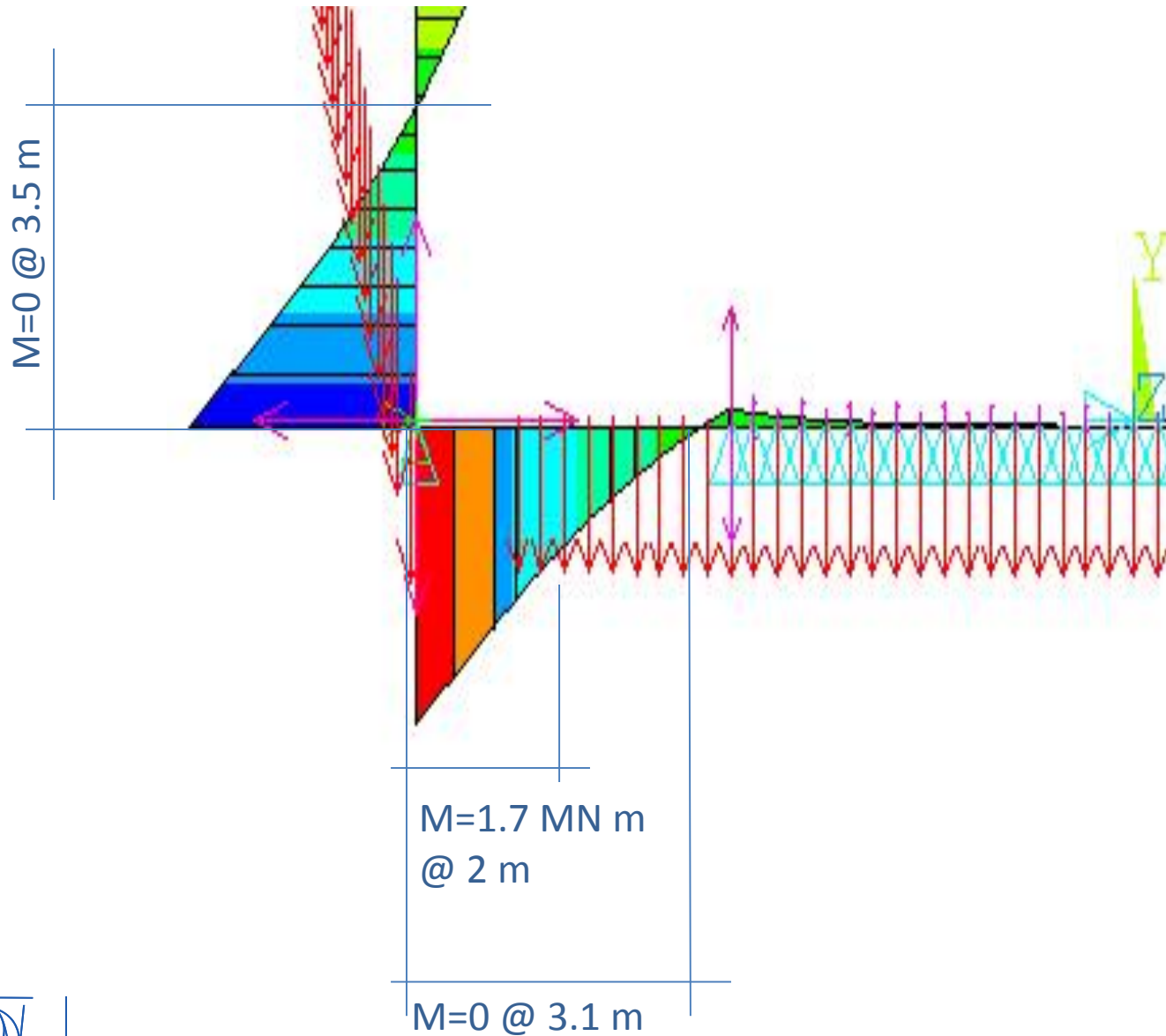


Bottom picture: Moment = 0 at 3.36 m height (mid beam axis)

Top picture: Moment = 0 at 3 m height (mid beam axis)

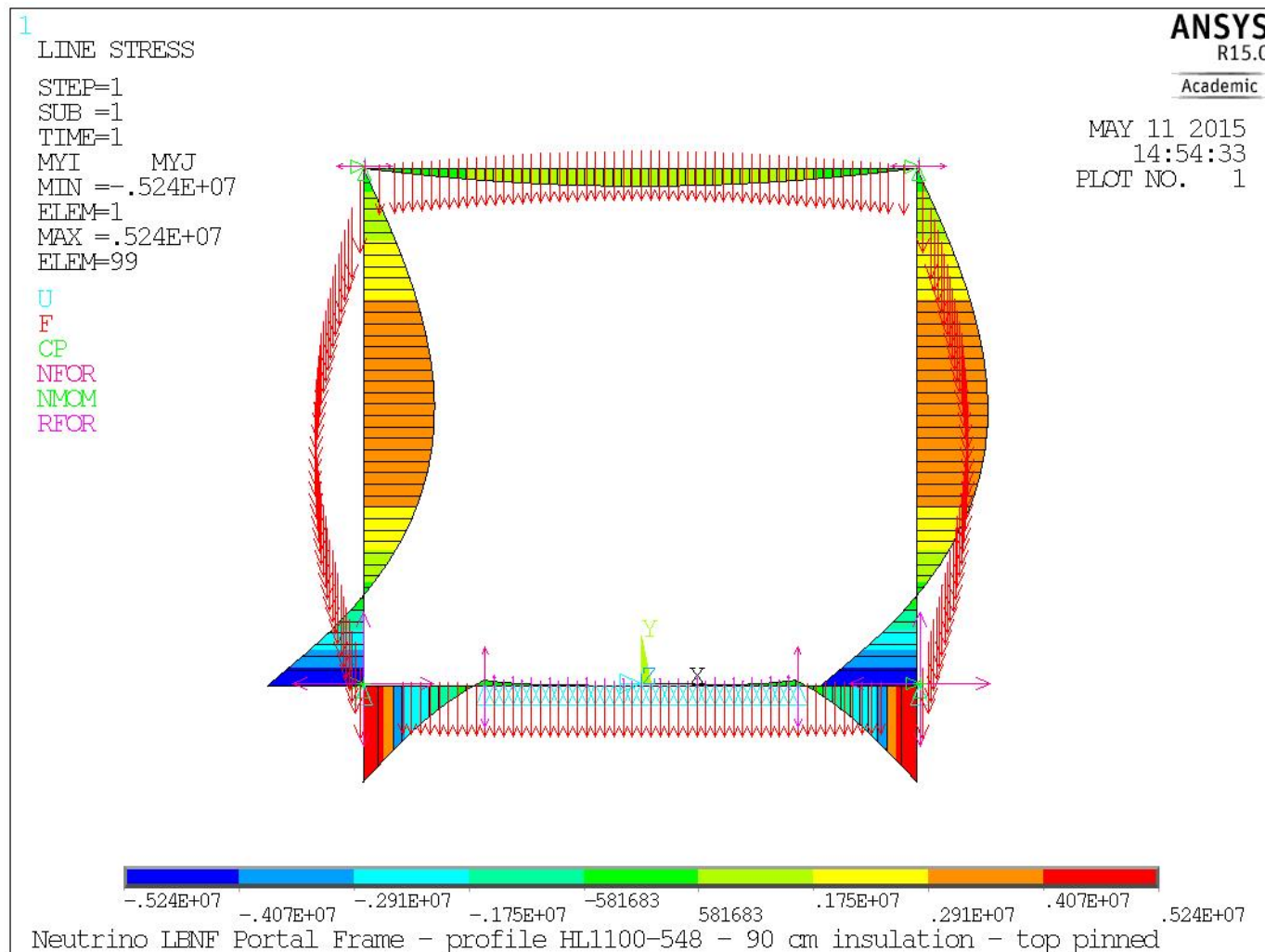


Corner piece dimensions



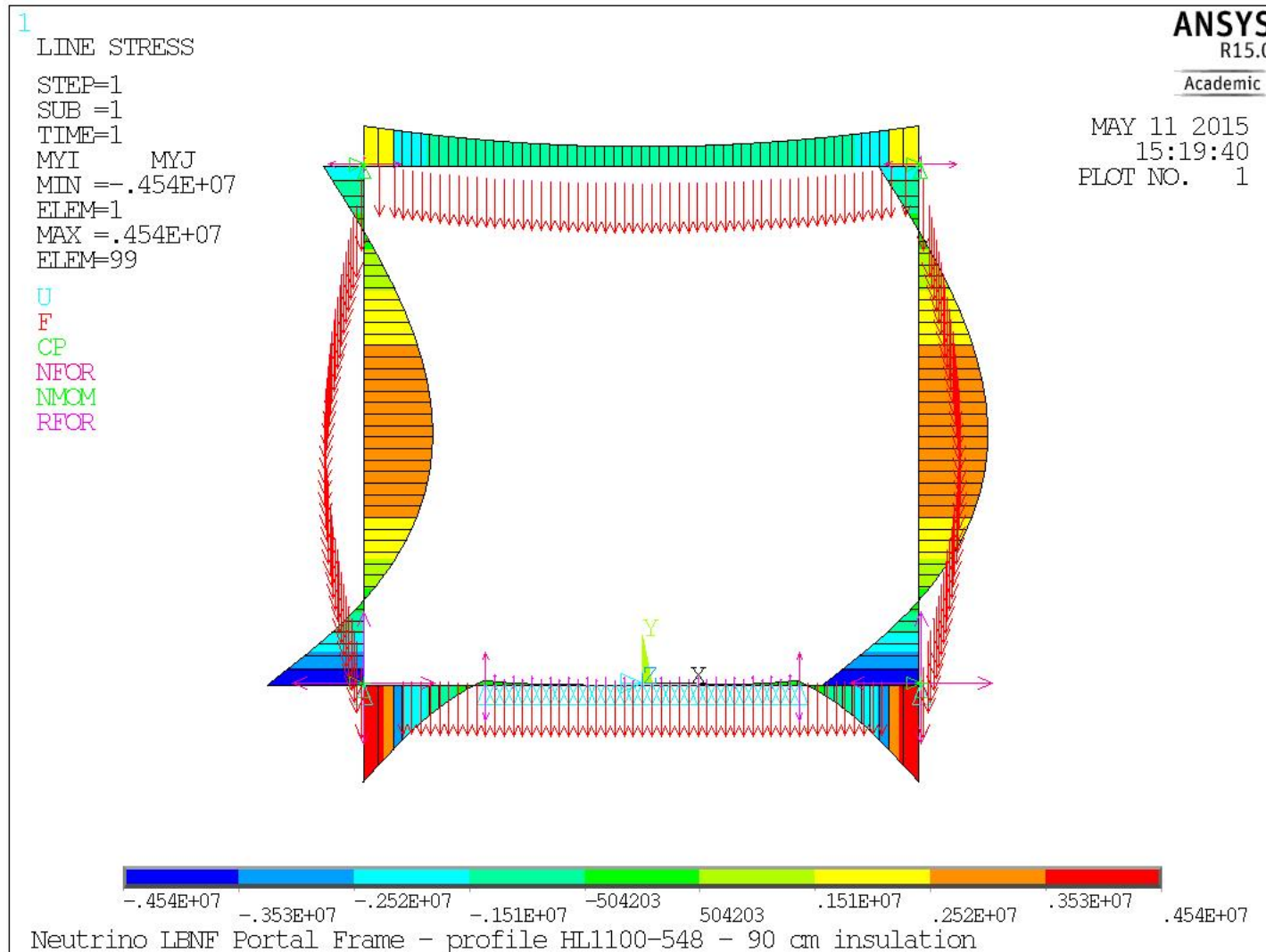
Static analysis results – top pinned

Scope: analysis top pinned connection (also applicable to short side wall)

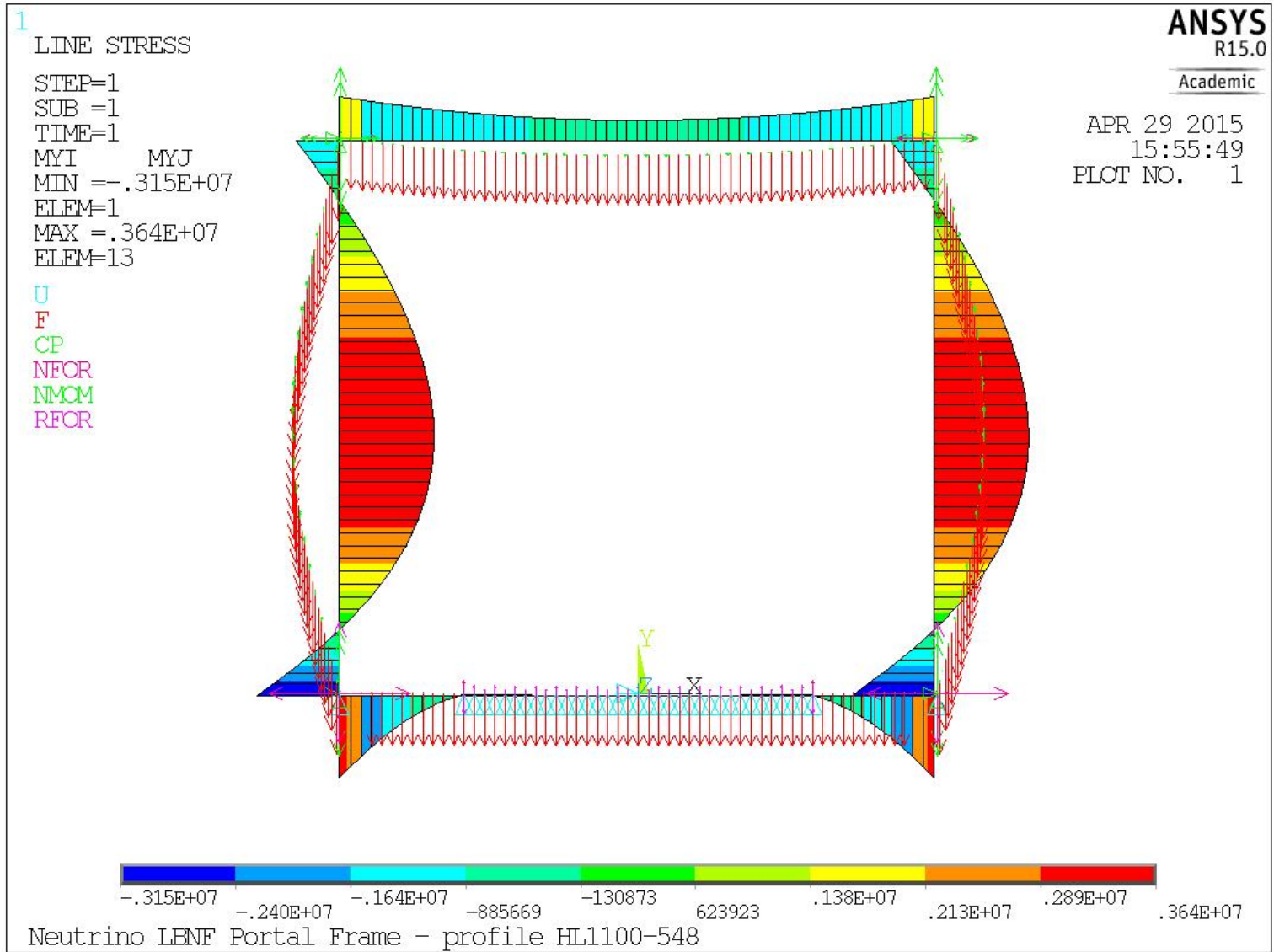


Consequence: bottom connection M increasing (by 0.7 MN m) – see next slide

Rem: static analysis results – top built in

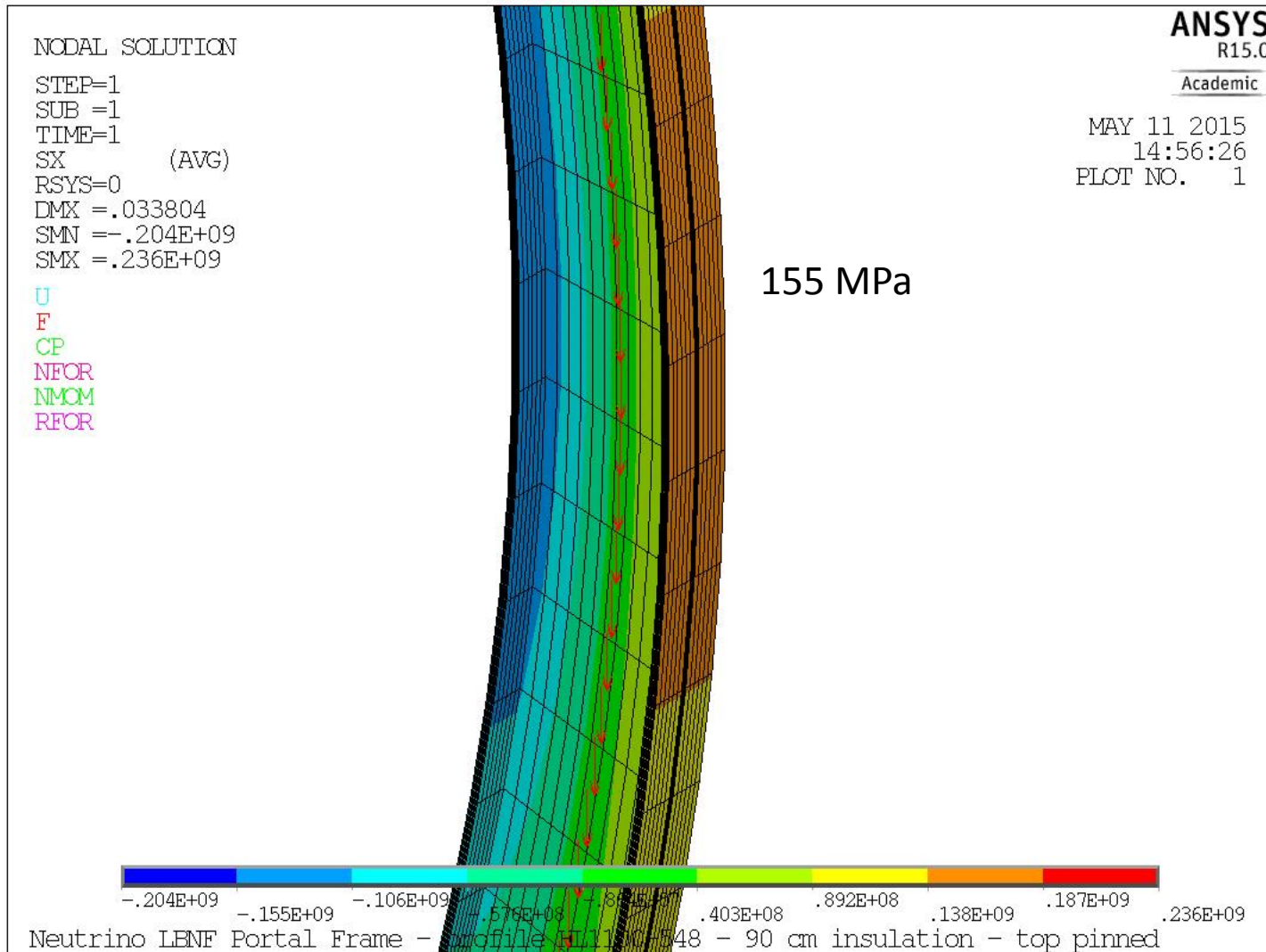


Rem: static analysis results – top built in

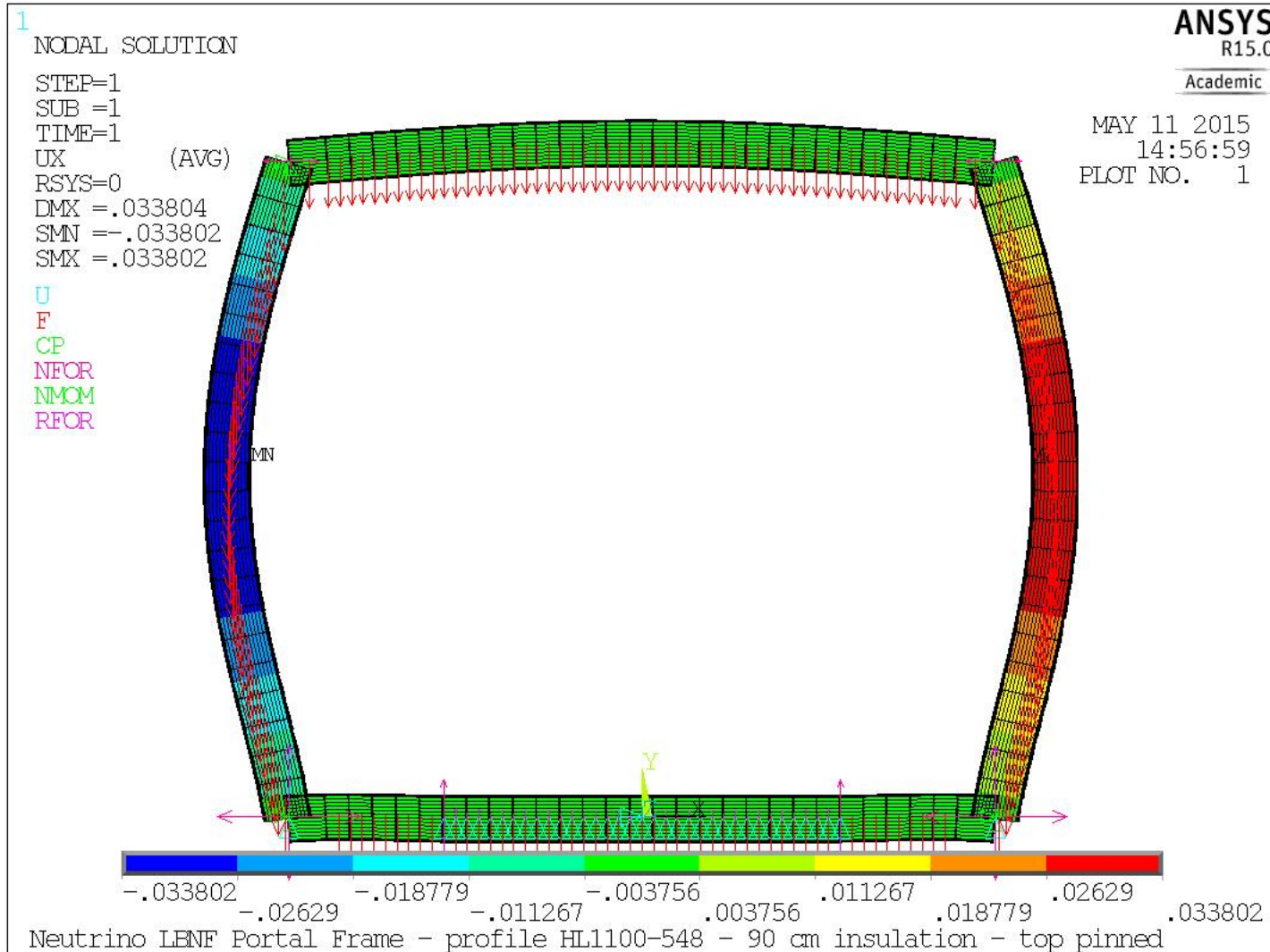


With (former) bottom bolted compliance included

Static analysis results – top pinned



Static analysis results – top pinned



Steel Grades

- Steel S355 (EC properties for $t > 40\text{mm}$)
 - $\sigma_y = 335\text{ MPa} \rightarrow \sigma_y/1.5 = 223\text{ MPa}$
 - $\text{UTS} = 470\text{ MPa} \rightarrow \text{UTS}/3.5 = 134\text{ MPa} \rightarrow \text{UTS}/2.4 = 195\text{ MPa}$
- Small Improvements by moving to S450 (EC properties for $t > 40\text{mm}$):
 - $\sigma_y = 410\text{ MPa} \rightarrow \sigma_y/1.5 = 273.3\text{ MPa}$
 - $\text{UTS} = 550\text{ MPa} \rightarrow \text{UTS}/3.5 = 157\text{ MPa} \rightarrow \text{UTS}/2.4 = 229\text{ MPa}$

Material