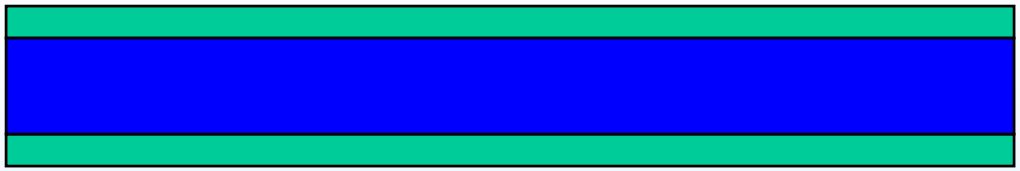
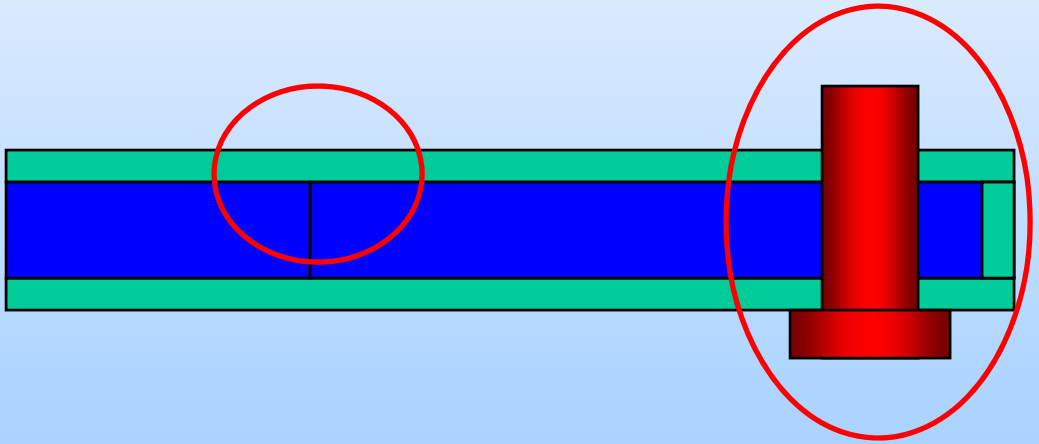
Some considerations about sandwich structures

Wolfgang and Diego



2.5 mm Austenitic stainless steel.

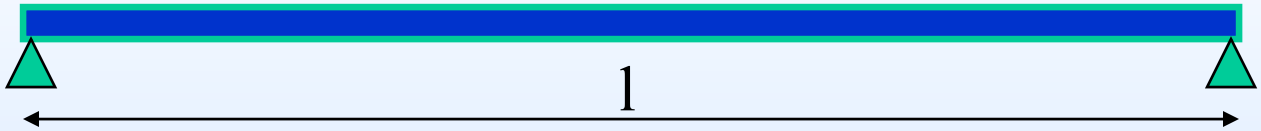
8 mm Tungsten grade (90% W, 5% Cu, 5% Ni) $\rho = 17$ g/cm^3.



Local effects require a minimum amount of steel

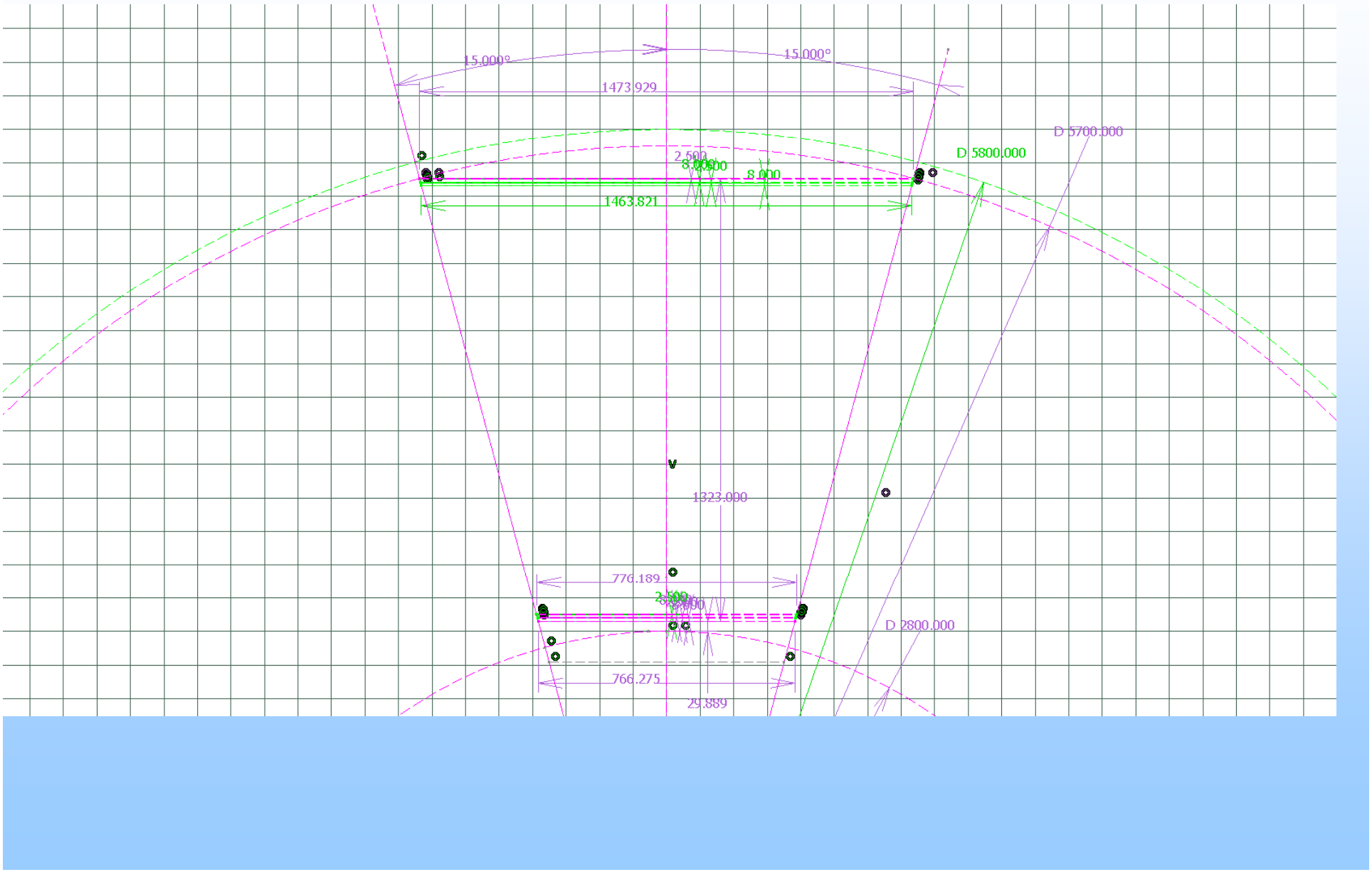
2 -3 mm-thick plates give a good resistance.

Deflection and stresses



- "Equivalent" density $\rho = 13.5$ g/cm^3 (about 176 kg/m^2)
- Λ=11.6 cm, X0=0.65 cm
- We used simplified formulas for beams and more complete formulas for plates
- Deflection is proportional to ρl^4, stresses to ρl^2
- Full contribution of tungsten to global stiffness or no contribution at all.

If l = 1500 mm we have a deflection between 2.5 mm and 4 mm and stresses below 2.5 kg/mm^2.


15.000°
15.000°
1473.929
D 5700.000
D 5800.000
2.500
8.000
8.000
1463.821
1323.000
776.189
2.500
D 2800.000
766.275
29.889

- If l=6000 mm we will have problems to handle the plates. If we start lifting the extremities we will reach the elastic limit for steel with the centre of the plate still on the ground.
- L = 3000 mm and a stack of 8-10 plates seems a good compromise. The total weight of this sub-detector will be less than 10 tonnes. This is a “reasonable” value when we have to handle, turn and assemble it.

First contact with our metallurgical service (S. Sgobba).

Brazing is possible but the parameters have to be optimized

S. Sgobba considers this a nice project and he is ready to work on this.