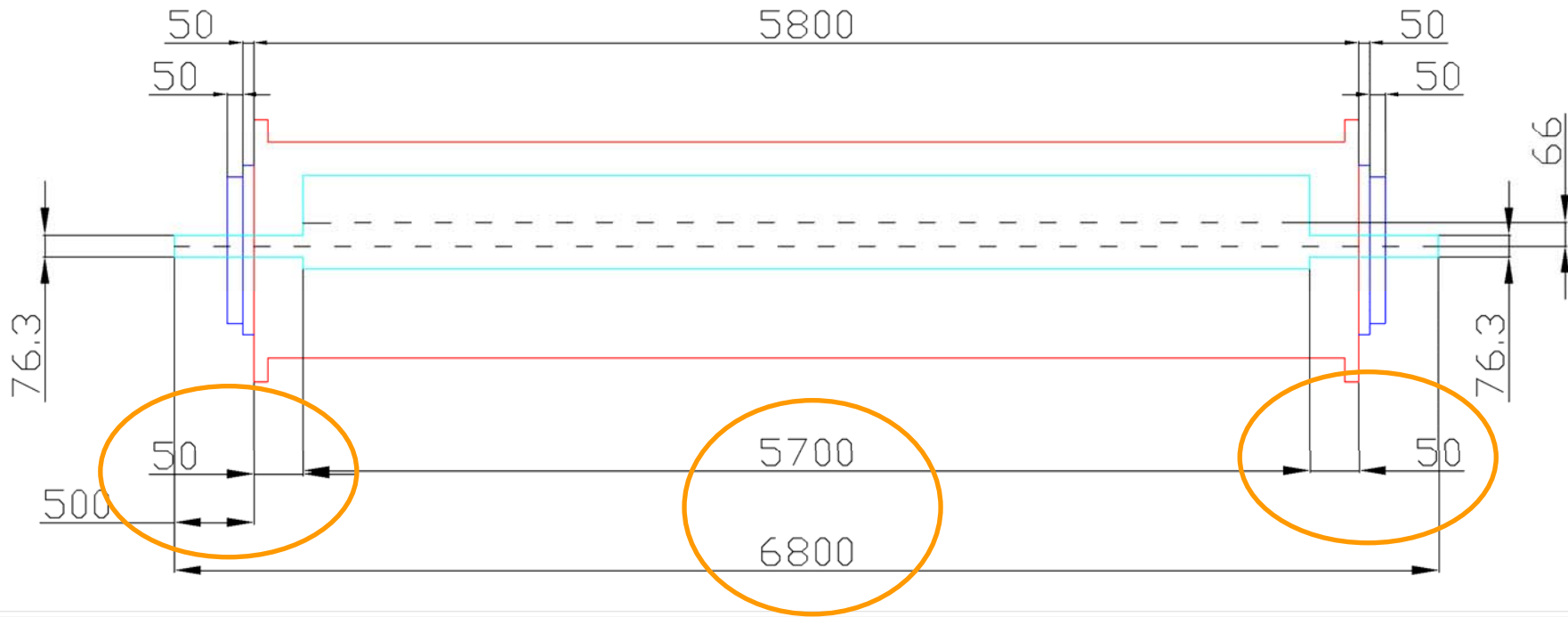


S1-global design: preliminary manufacturer comments

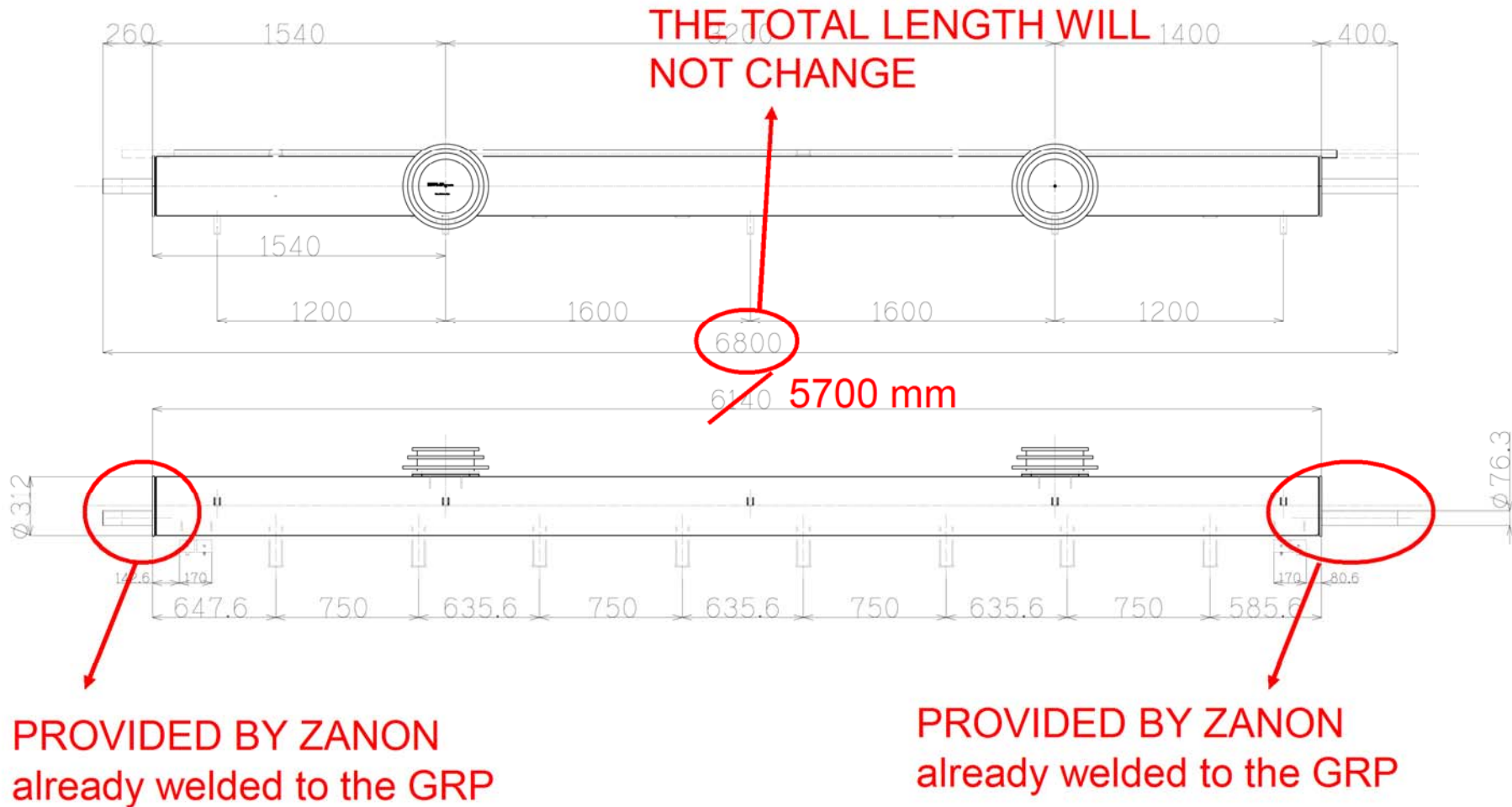


20th January 2009
Serena Barbanotti

- KEK required overlength for all pipes: 500 mm
- GRP fabrication up to now: stock size steel sheets bended and welded
- Sheets maximum length of 6 m
- Suggestion: limit GRP total length below 6000 mm and extend it to the nominal overlength out of the vessel after the reduction to the 76.3 mm pipe connection
- Thus Zanon will provide and install the 312-76.3 mm welded transition
- The total length of the pipe with the reducer will be 6800 mm, with 500 mm overlength from the vacuum vessel end flange as before



GRP Design

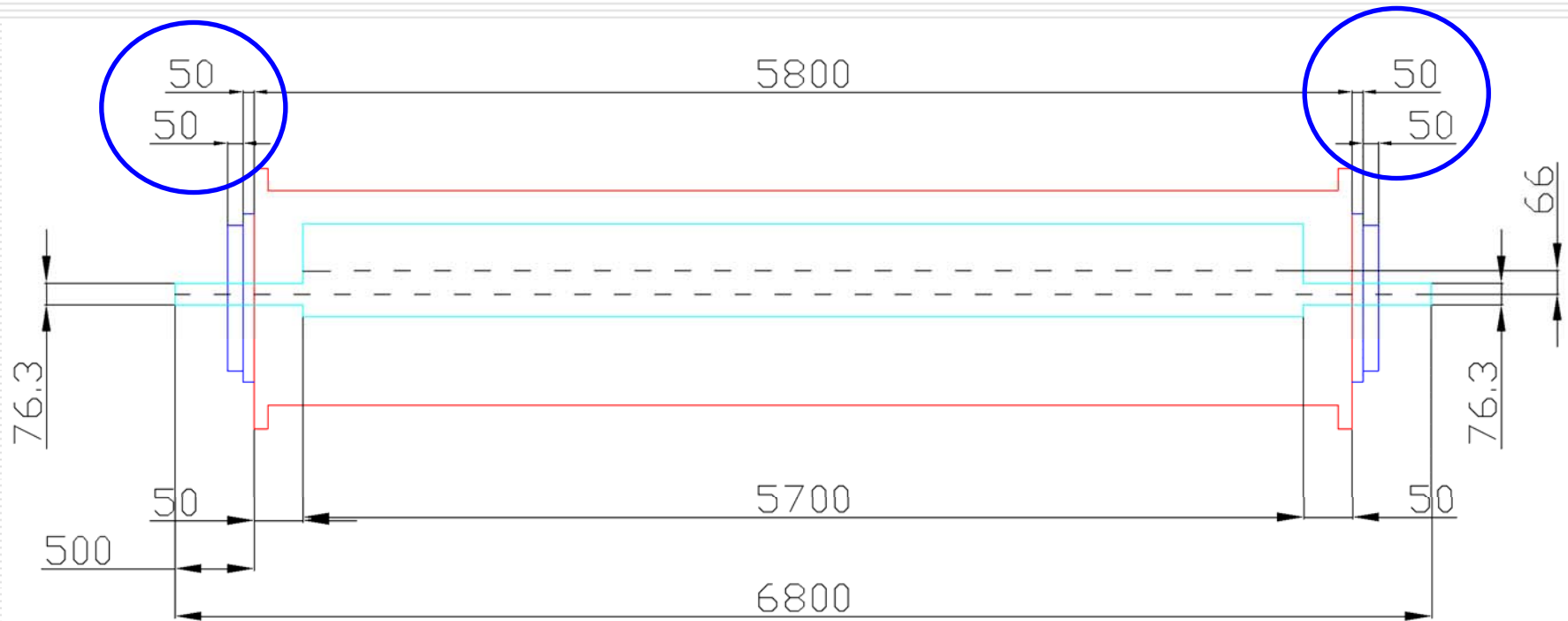


Thermal shields overlength



- The overlength of the shields from the vessel flange need to be fixed
- Shield parts are currently assembled starting from Al sheets with a length of 3000 mm, so total shield length should be below 6000 mm
- We suggest:
 - Distance between shield 4.5 K and vacuum vessel: 100 mm
 - Distance between shield 70 K and vacuum vessel: 50 mm
 - (As a comparison, in the Type 3 module the 70 K shield was protruding by about 80 mm from the vessel flange and the 4.5 K shield about 180 mm)

Thermal shields overlength



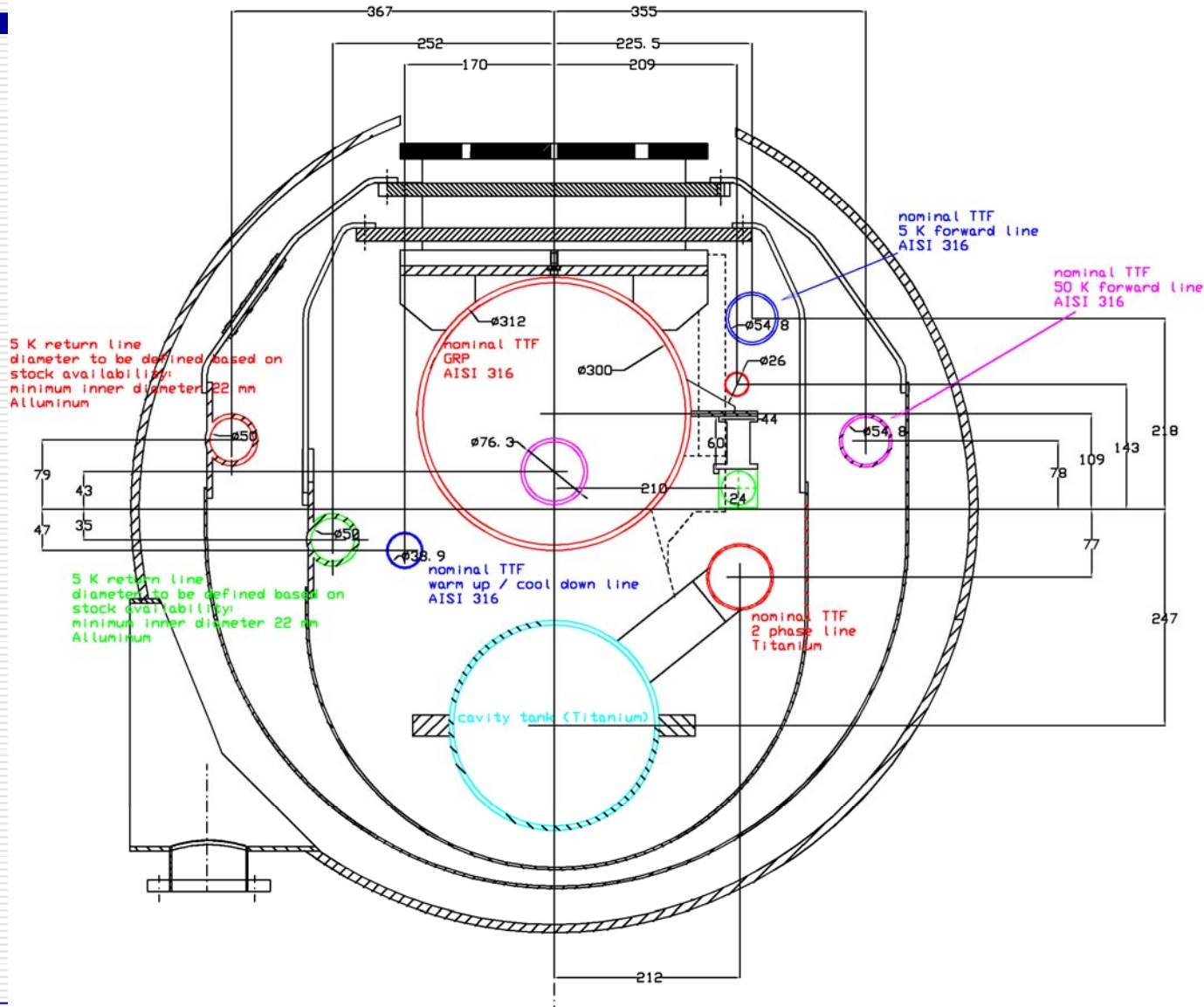
Piping and module cross section



Main changes with respect to type 3 cross section:

- 2.2 K forward removed
- 5 K forward line and cable pipe position
- 5 K and 70 K return line (extruded pipes) diameter can be reduced (up to a minimum of 22 mm), depending on stock availability.
- 5 K and 70 K return line (extruded pipes) profile can change (slightly different fin design), depending on stock availability (available in Zanon: 2 pipes about 6 m long in total and another pipe with smaller fin).

Piping and module cross section

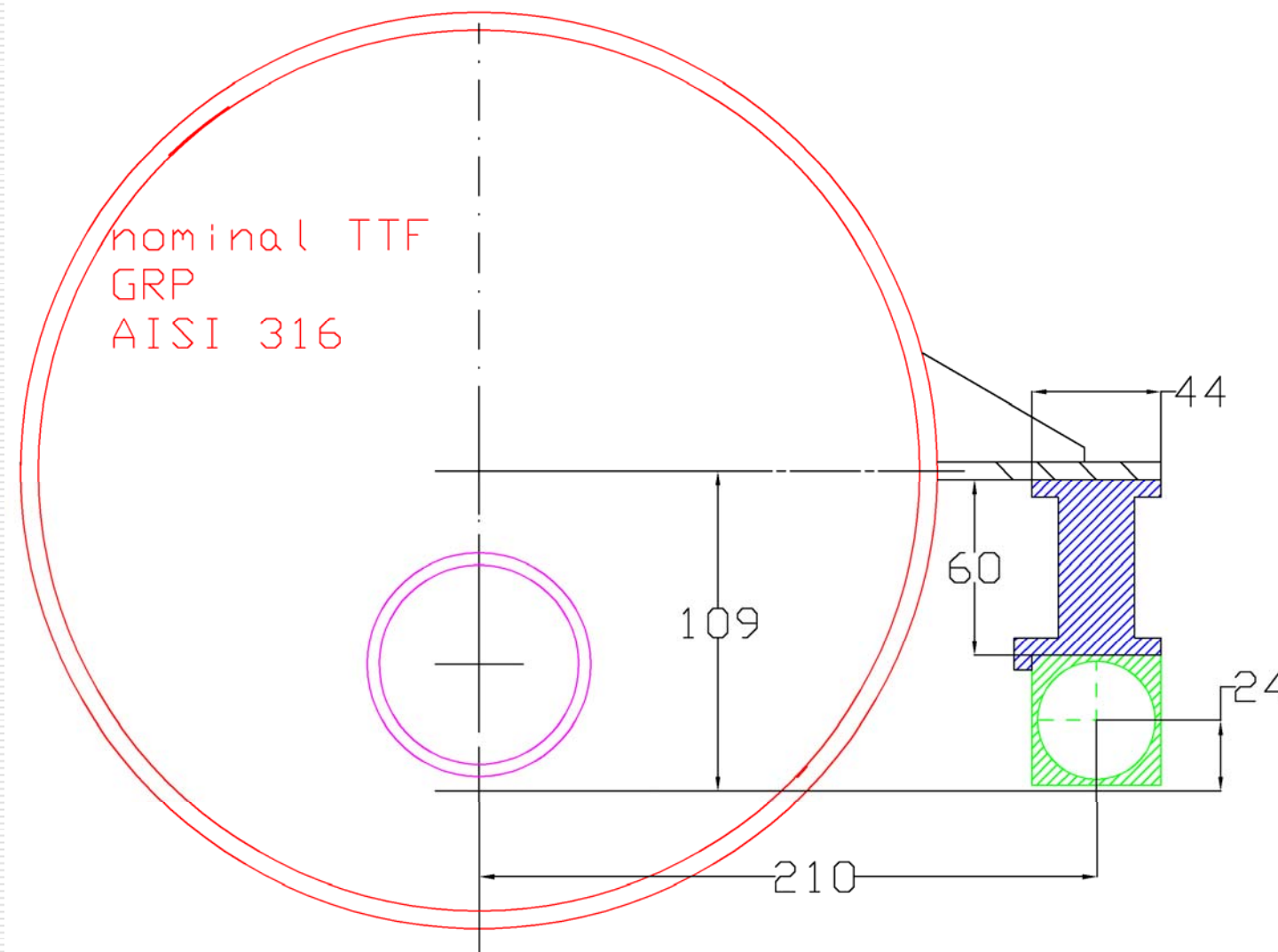


WPM position and support design

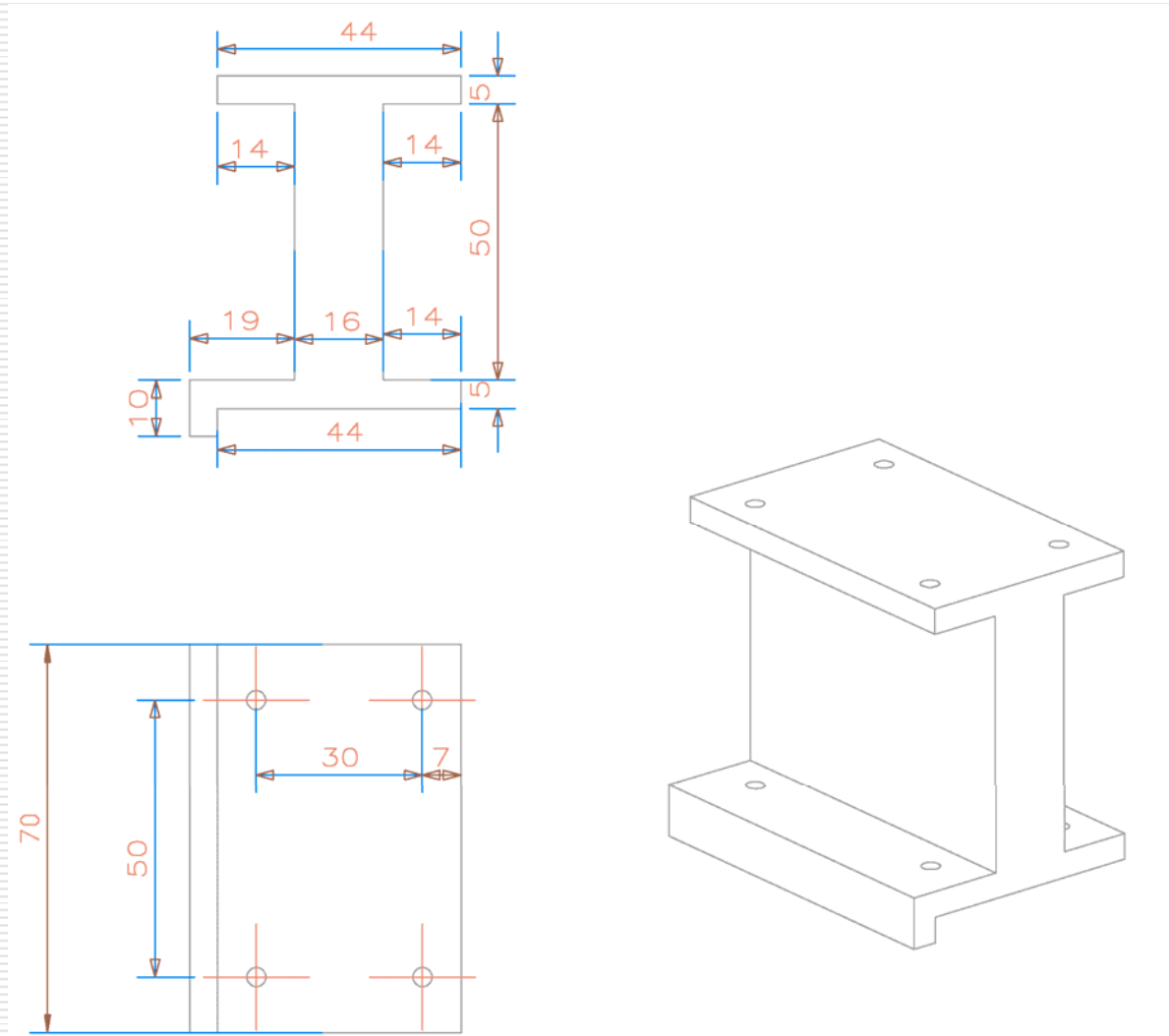


- To simplify machining and assembly, we suggest to rotate the WPM support (see next slide).
- We suggest KEK will provide the blue support, defining its interface (position, dimension of holes and required tolerances) with the support plane welded on the GRP.
- All tolerances and surface properties have to be defined
- The WPM sensors, cables and supports will have to be delivered from KEK to Zanon before the final preassembly of the module.

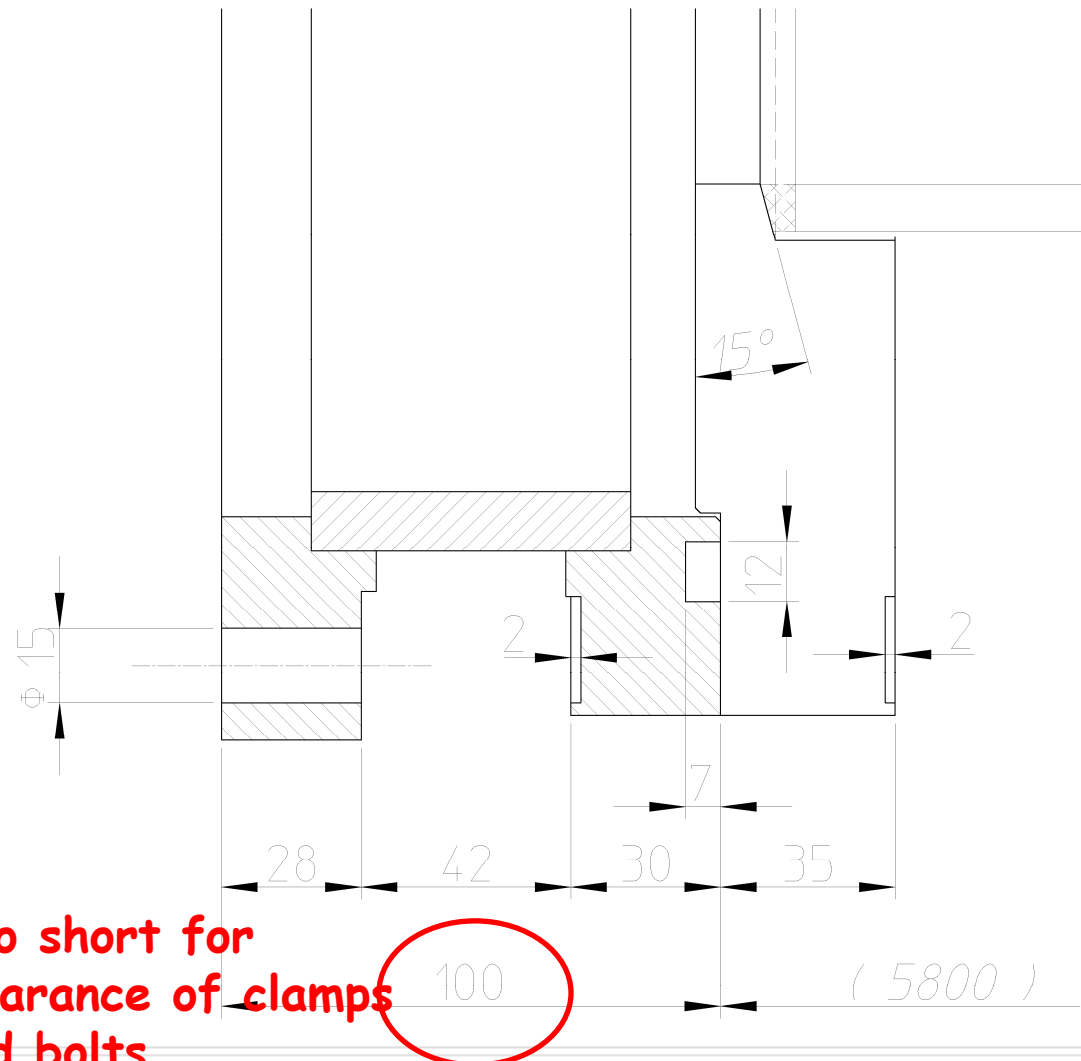
WPM position and support design



WPM position and support design

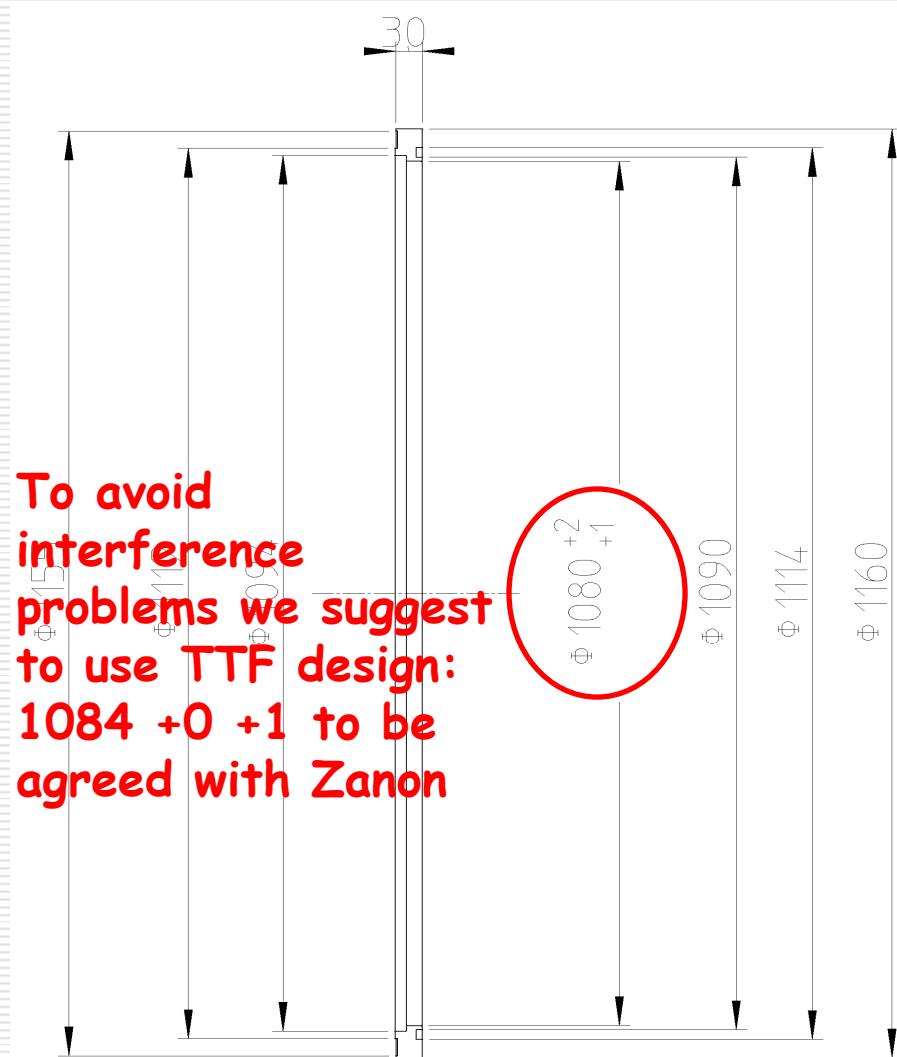


Vacuum vessel end flange and adaptor



Too short for
clearance of clamps
and bolts

Vacuum vessel end flange and adaptor



To avoid interference problems we suggest to use TTF design: 1084 +0 +1 to be agreed with Zanon

Longitudinal positions of coupler



- KEK needs to analyze and fix the longitudinal position of one coupler port opening on the vessel. After this decision, using the nominal cavity distances (coupler port to pad and between pads) the longitudinal positions of the cavity supports can be decided, taking into account the warm-cold contraction of the invar rod. This information is also needed in order to determine the segmentation of the bottom shield panel.
- Once the positioning of the coupler openings on the vacuum vessel with respect to the fixed post is defined, all other distances can be calculated.

Cold/warm behavior: coupler, cavity and shape spacing



- Distance between consecutive couplers at 2 K = 1383.6 mm
 - to be used as distance between two consecutive coupler openings on VV
- Distance between two consecutive couplers on invar rod at 300 K = $1383.6 * (1+0.0004) = 1384.15$ mm.
 - (Invar thermal contraction coefficient: 0.0004 m/m)
 - distance between two consecutive cavity coupler centers at warm after clamping to the invar rod (distance between cavities for string alignment)
- Cavities suspended to GRP through pads (at 2K distance between pads on consecutive cavities = 1383.6 mm)
- Shapes hold pads at 300 K and 2 K
- Distance between consecutive set of shapes on the GRP calculated using a mean value of the thermal contraction coeff of invar and stainless steel (SS thermal contraction coefficient: 0.003 m/m)
- Obtained distance between shapes = 1385.6 mm



Invar rod fixture

- In TTF cryomodule type 3+ a special shape has been design to fix the longitudinal position of the invar rod just below the fixed post. We suggest to use the same scheme.



- GRP Design:
 - design concept with shorter pipe and longer reducer already installed by Zanon.
 - internal diameter (or wall thickness) of the pipe reducer.
- Thermal shields overlenghts:
 - INFN proposed values
- Piping and module cross section
- WPM:
 - Support rotation
 - Support interfaces with the support plane welded on the GRP
 - Who produces the supports

Decision to be agreed between INFN - KEK - Zanon



- Vacuum vessel end flange and adaptor modifications
- Coupler opening positioning on VV and consequently spacing of cavities, positioning of shapes and invar rod

All these items can be further discussed during KEK visit to INFN and Zanon.