Update on IR modelling for impedance and trapped modes analysis

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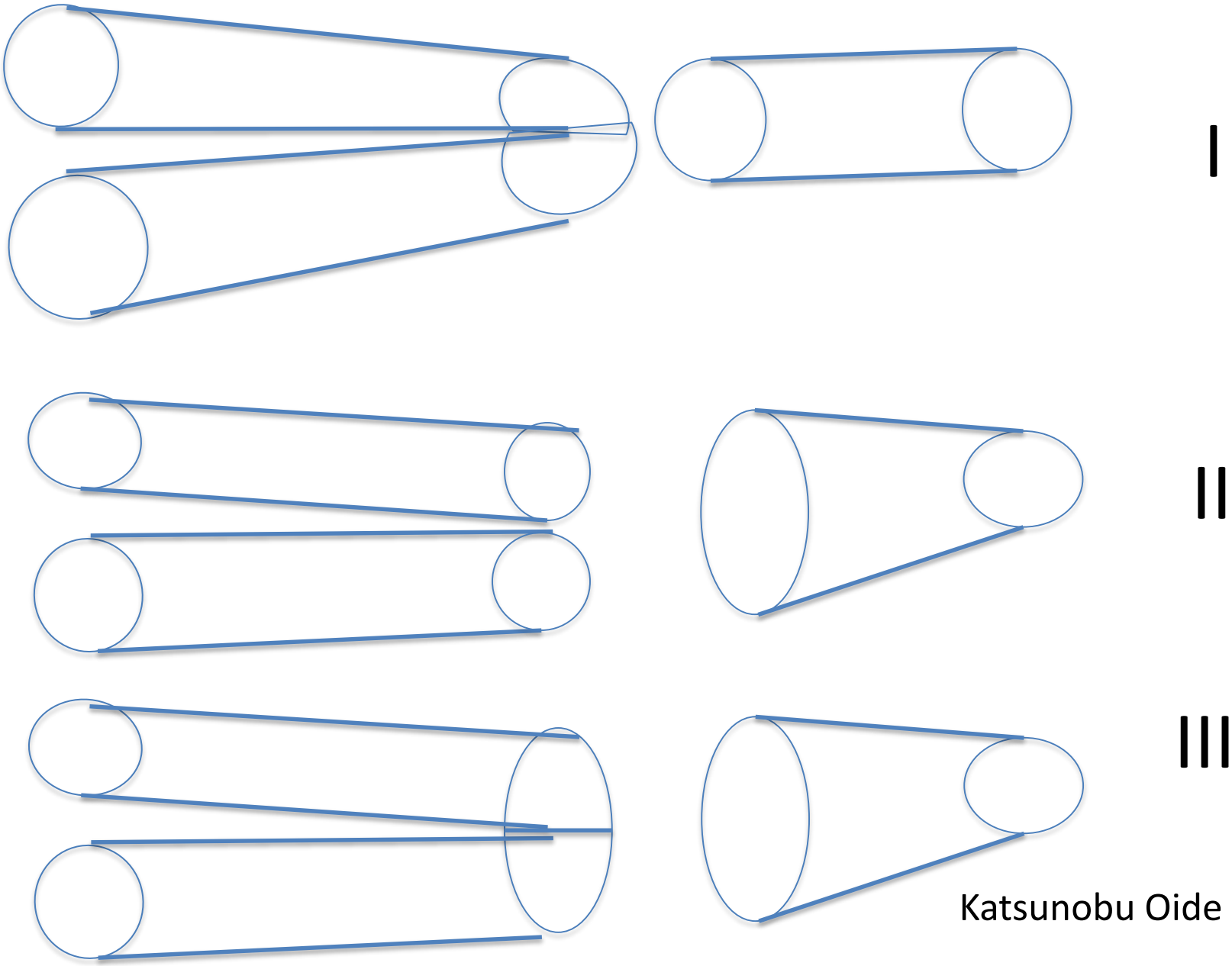
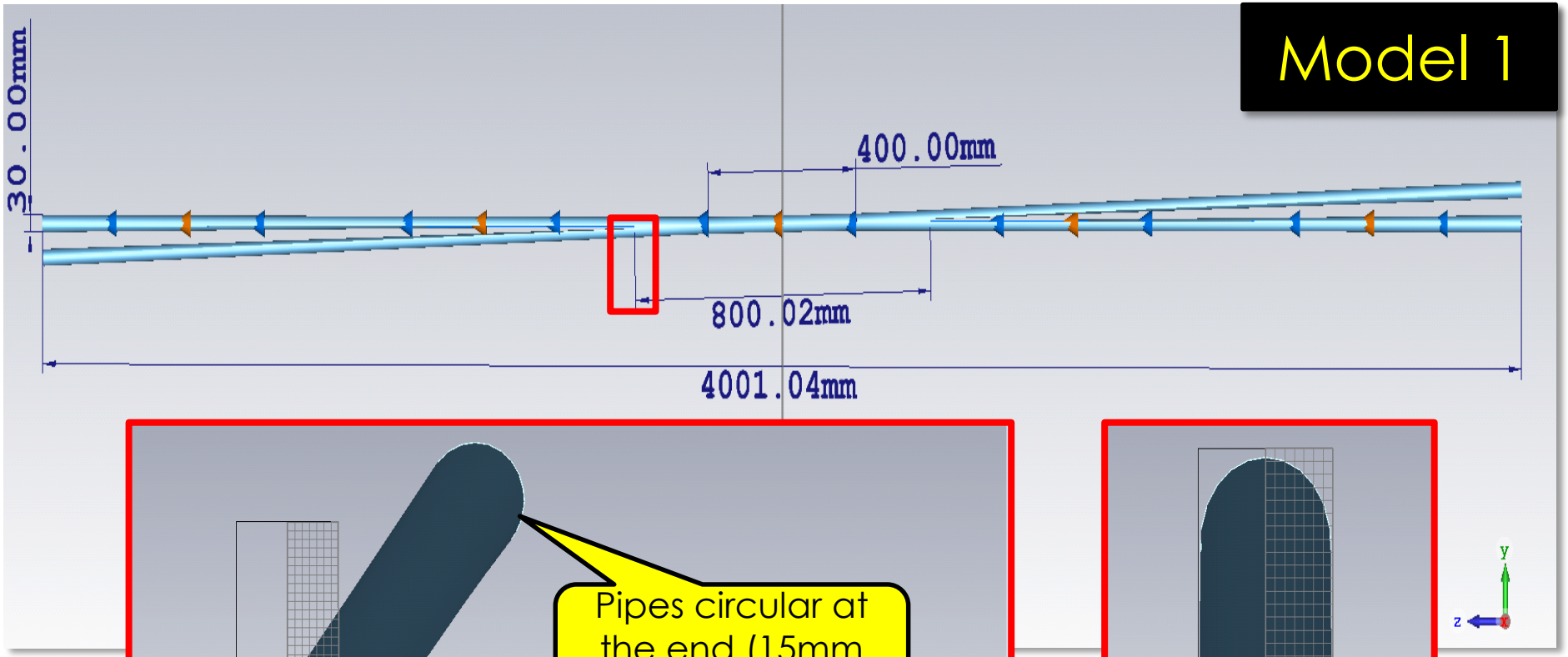
SLAC NATIONAL ACCELERATOR LABORATORY

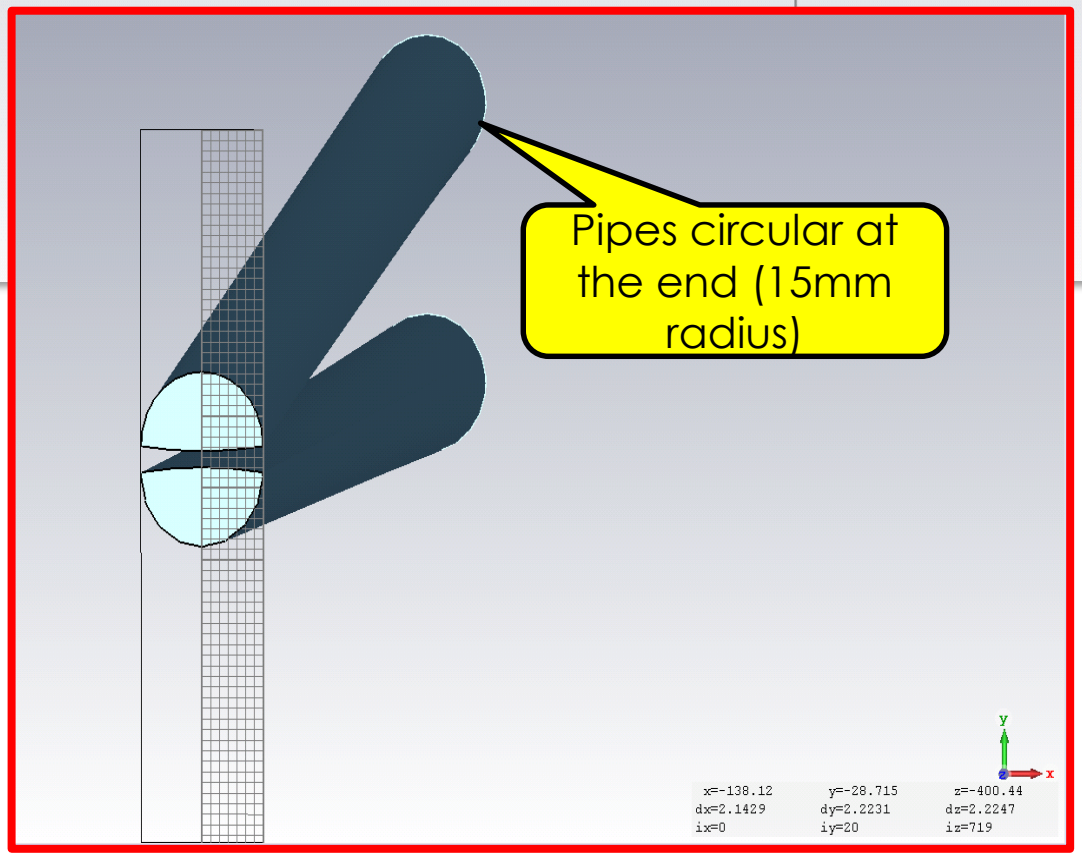
Current status of HOM analyses

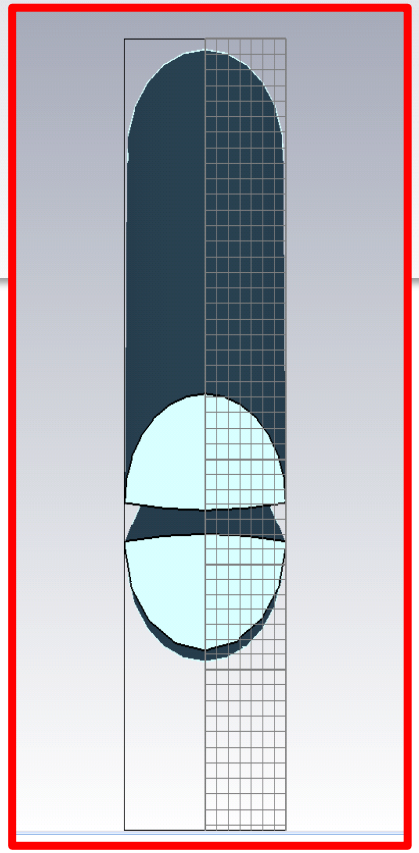
- Understanding the mesh distribution control in the simulations
- Three different models of IR with same diameter of incoming pipes and a central pipe
  - Incoming pipes are squeezed to a half circle to merge into the central pipe with a constant diameter
  - Incoming pipes are circular pipes but the central part has a transition to an approximately elliptical shape of of a double size in the horizontal direction.
  - Full smooth geometry
- We got good results for IR model I, also for Eleonora model (II) and I hope that we will make a “smooth” model (model III)and get some results before Berlin


I
II
III
Katsunobu Oide

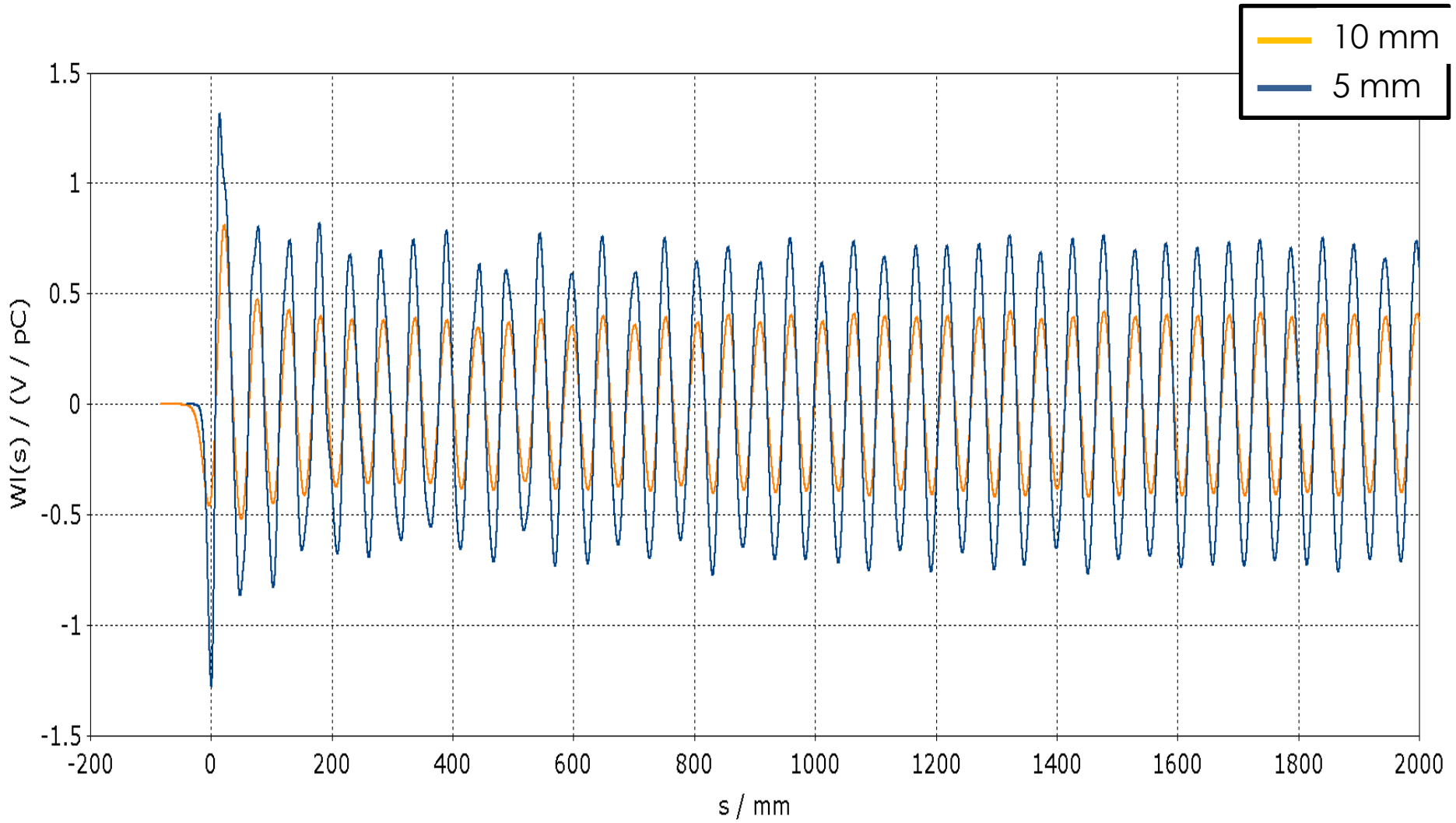
Model 1


30.00mm
400.00mm
800.02mm
4001.04mm

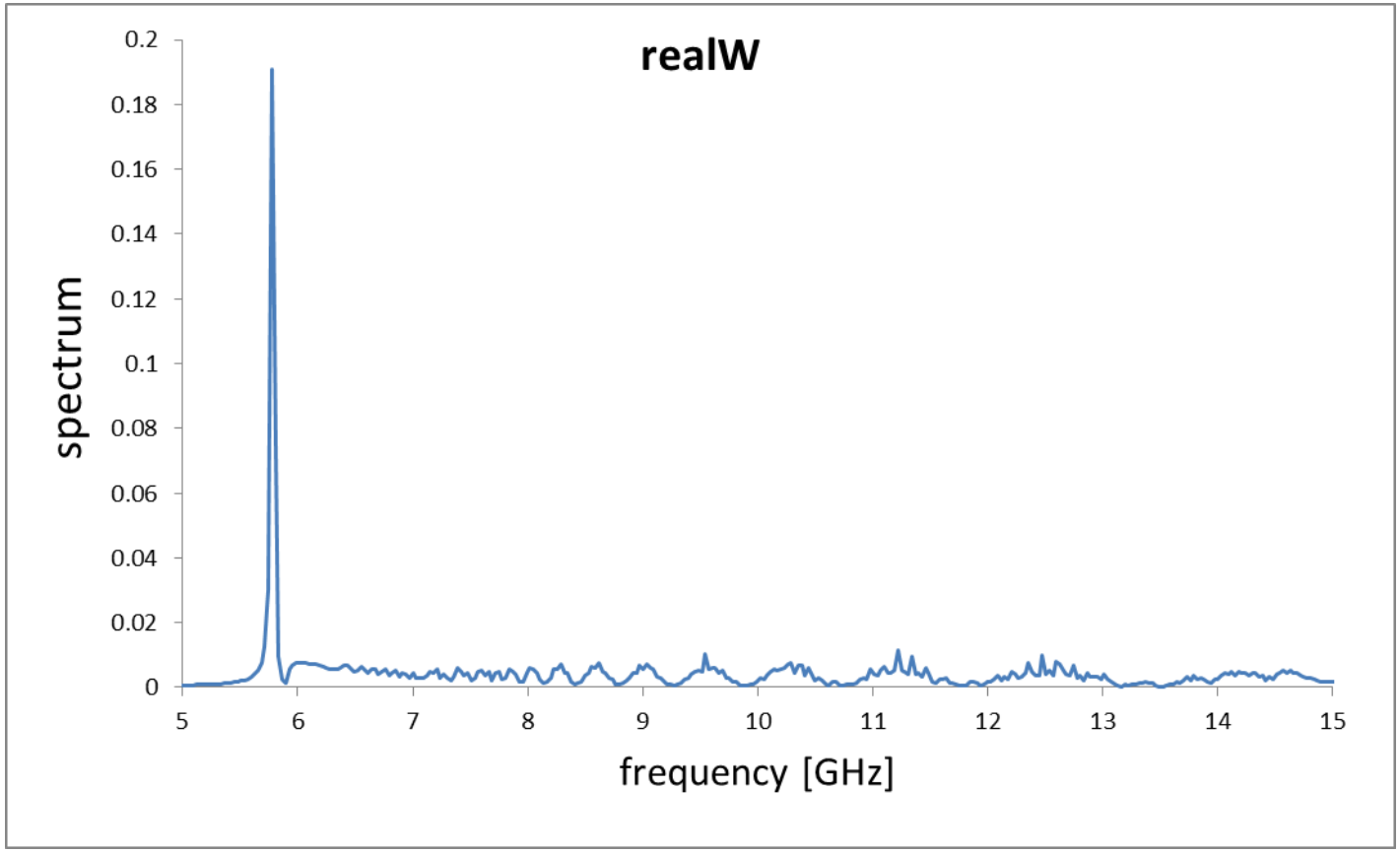

Pipes circular at the end (15mm radius)
x=-138.12 y=-28.715 z=-400.44
dx=2.1429 dy=2.2231 dz=2.2247
ix=0 iy=20 iz=719


y
z

Wake potential

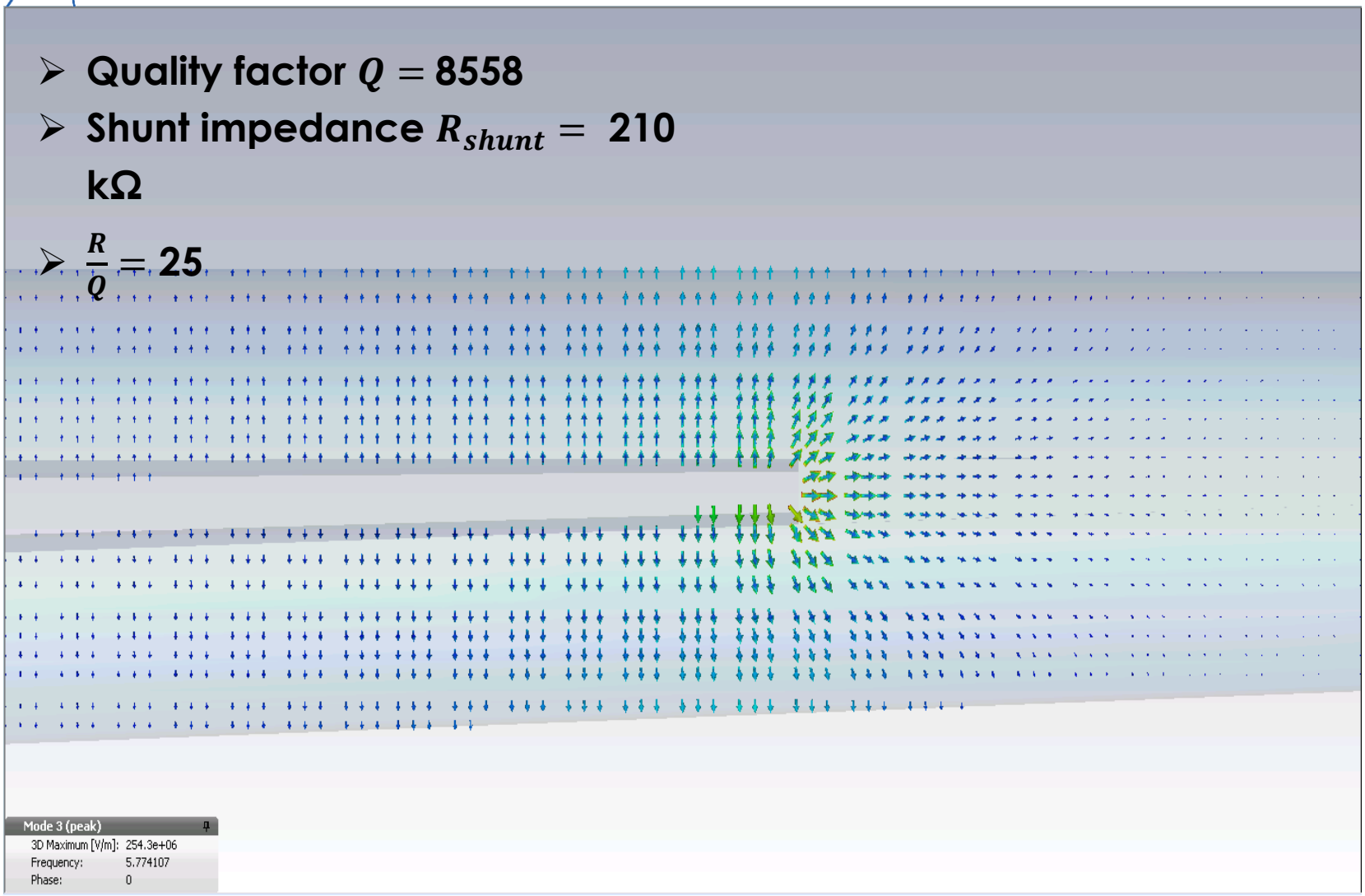


Spectrum $f_{trapped}$=5.77 GHz

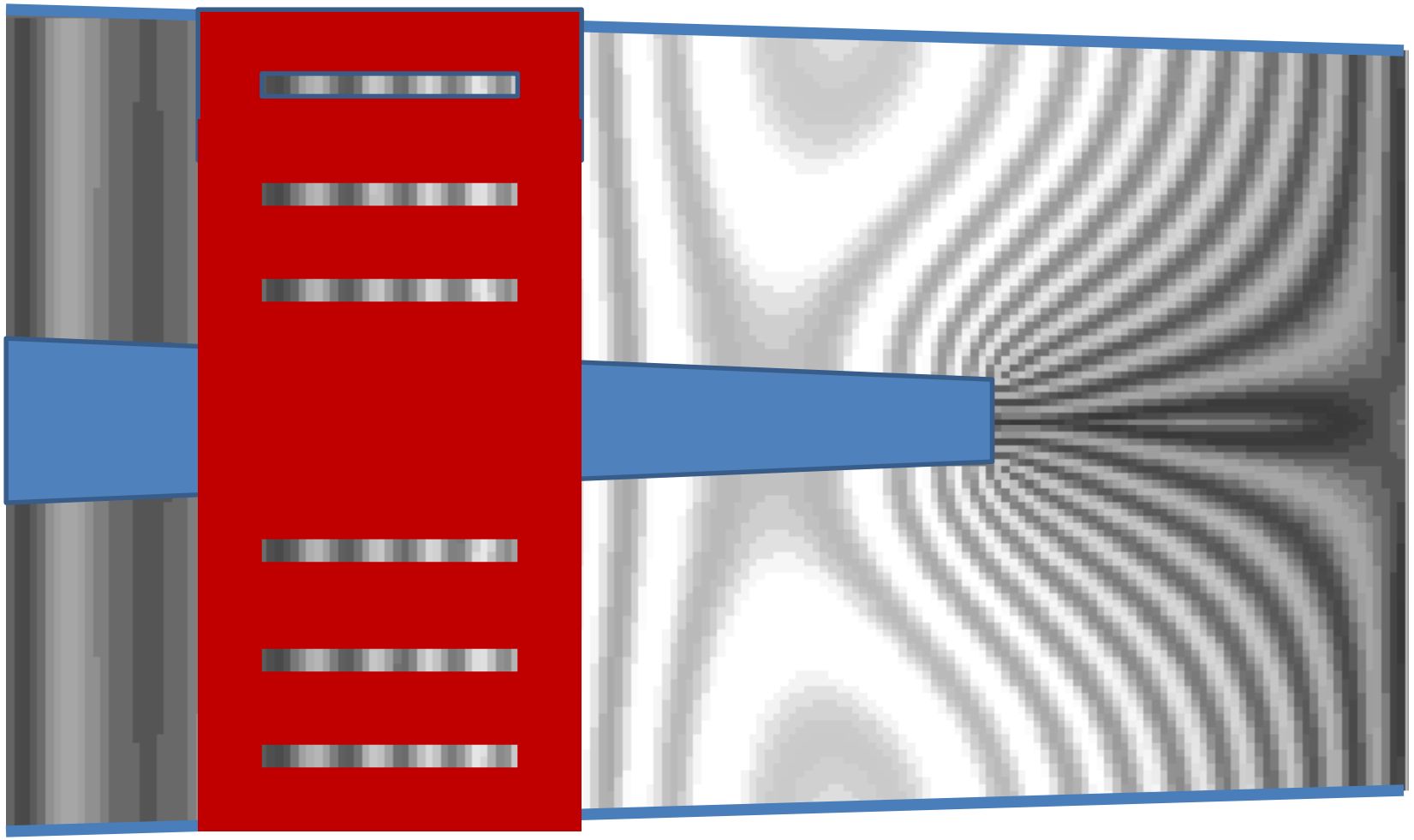


CST eigenmode simulations

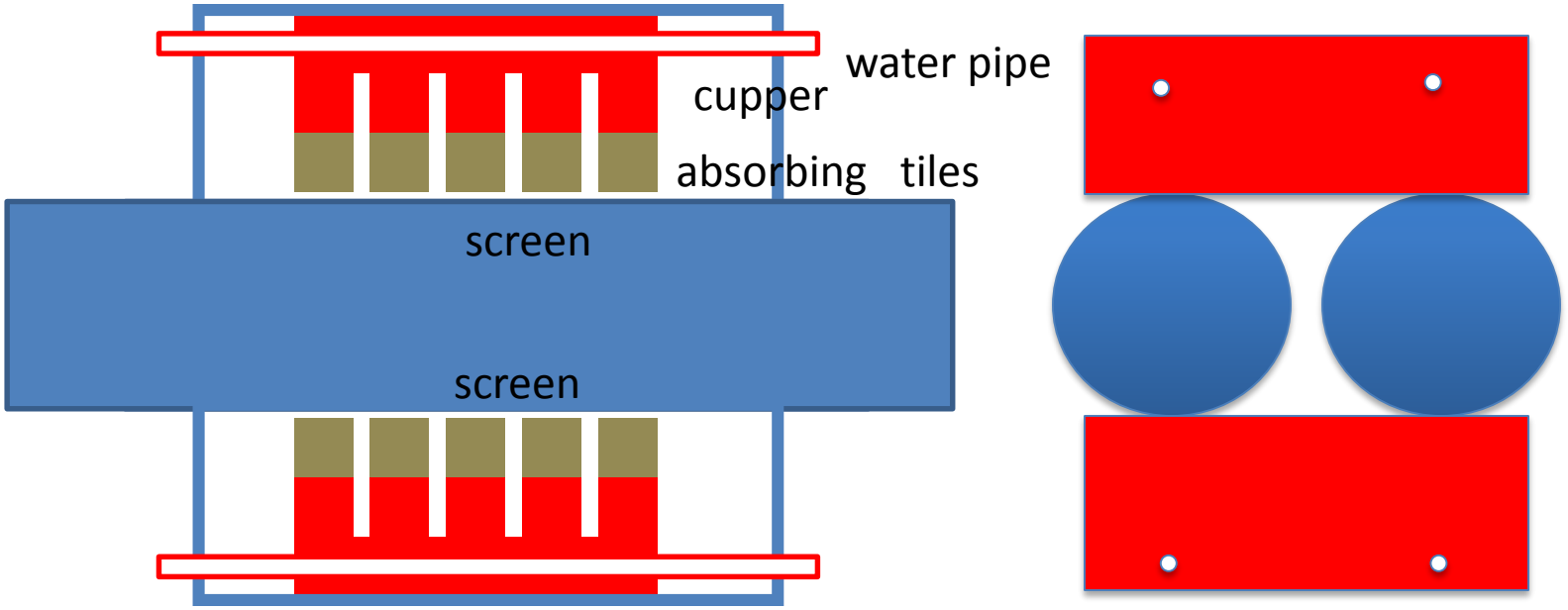
- Quality factor $Q = 8558$
- Shunt impedance $R_{shunt} = 210$ kΩ
- $\frac{R}{Q} = 25$



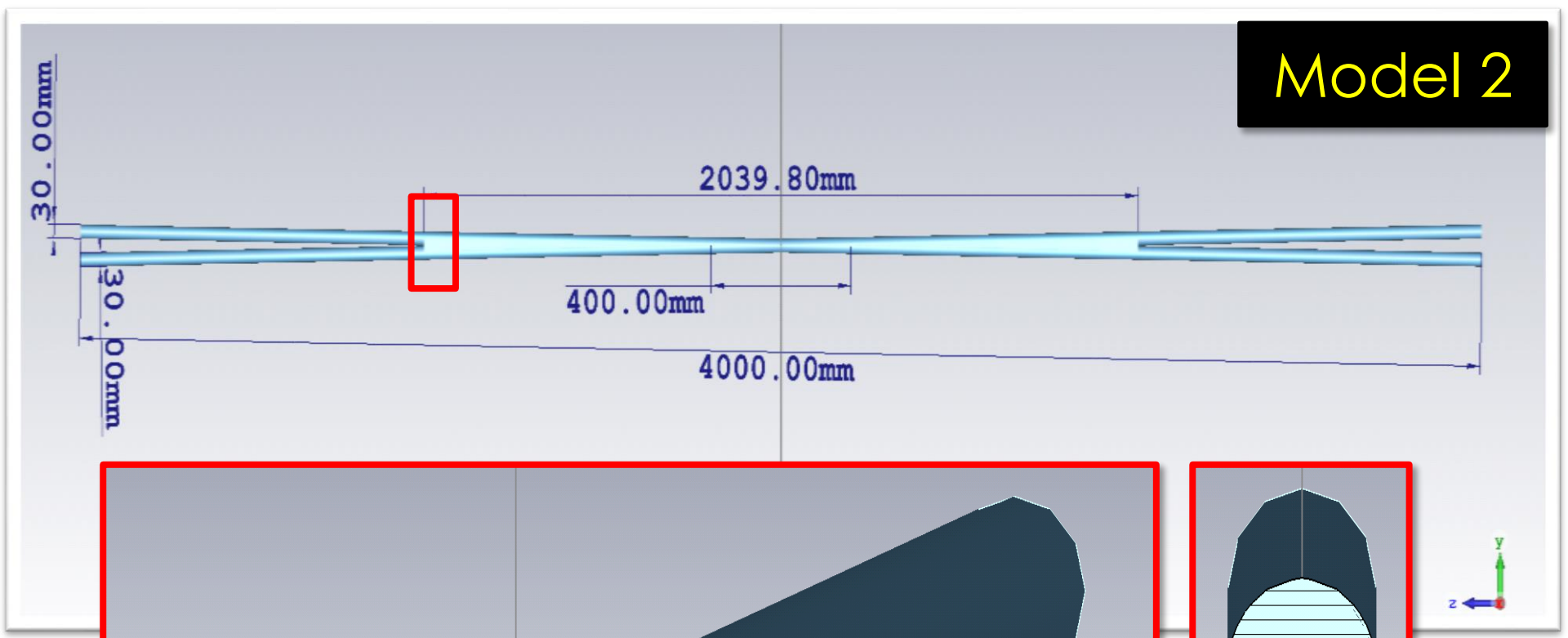
A screen with longitudinal slots

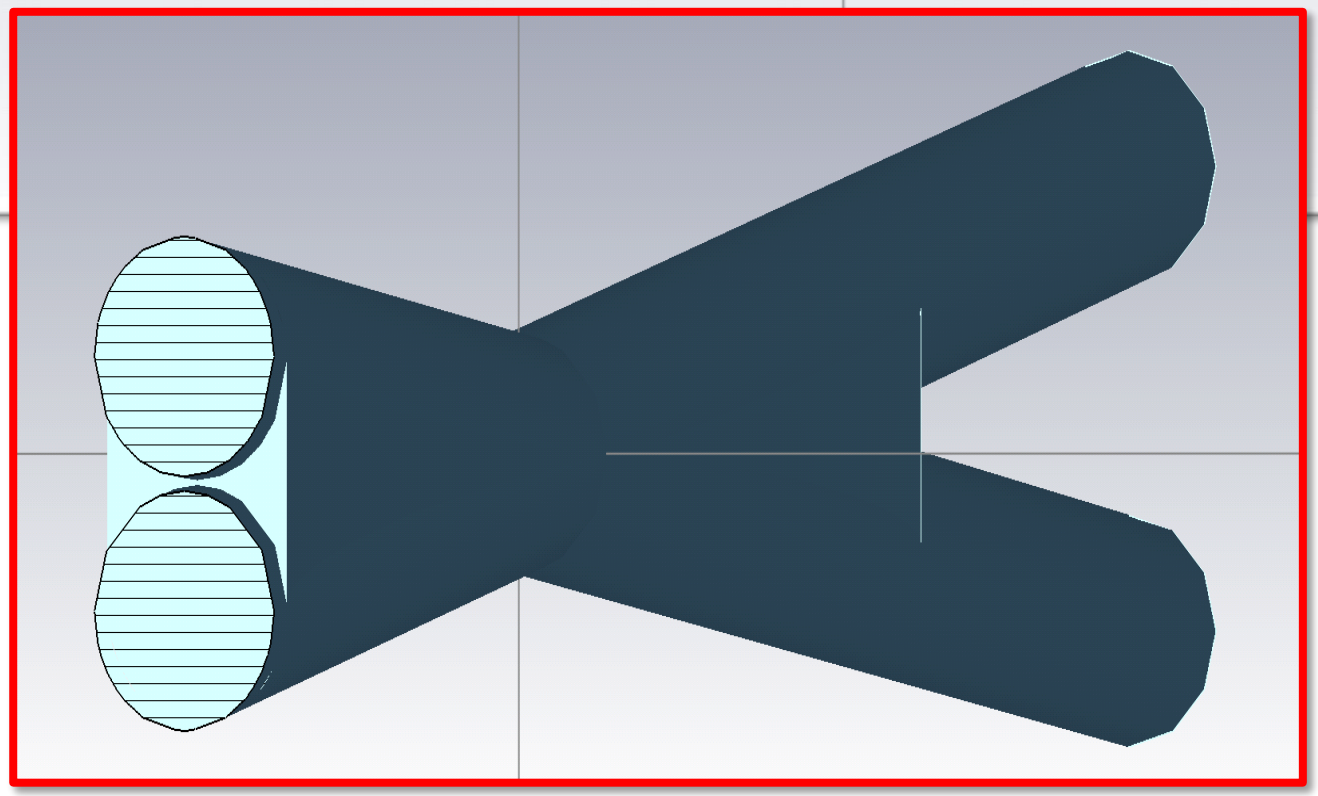


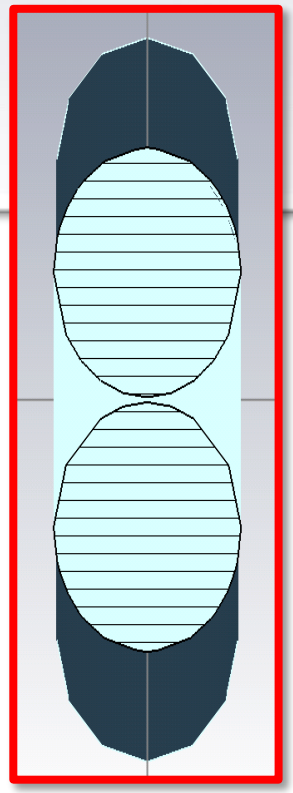
HOM absorber for FCC IR



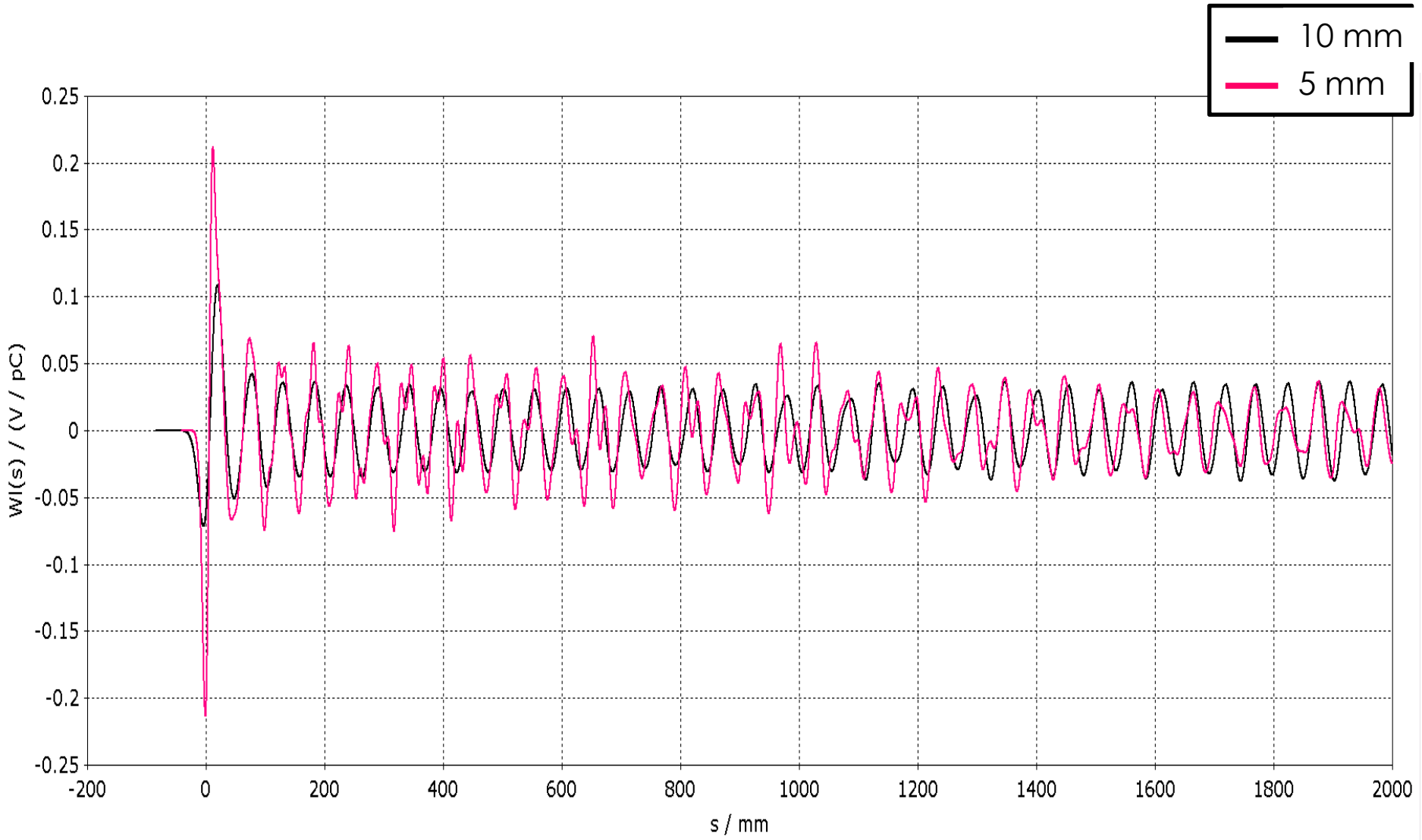
Model 2







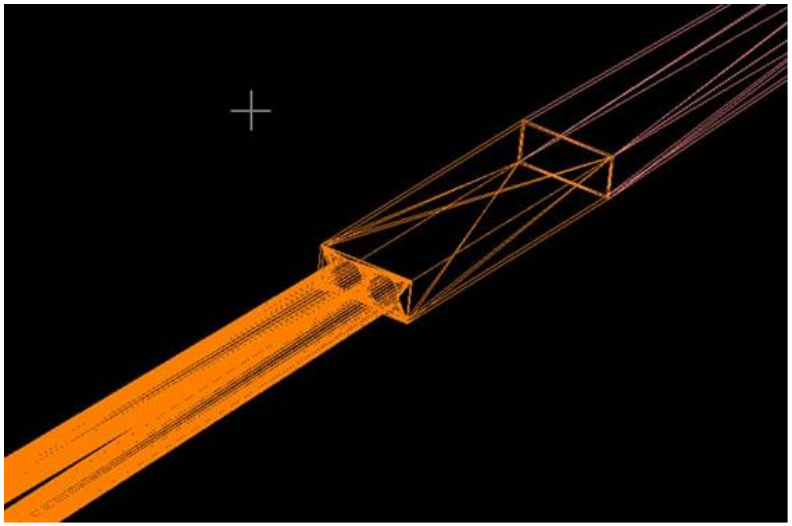
Wake potential

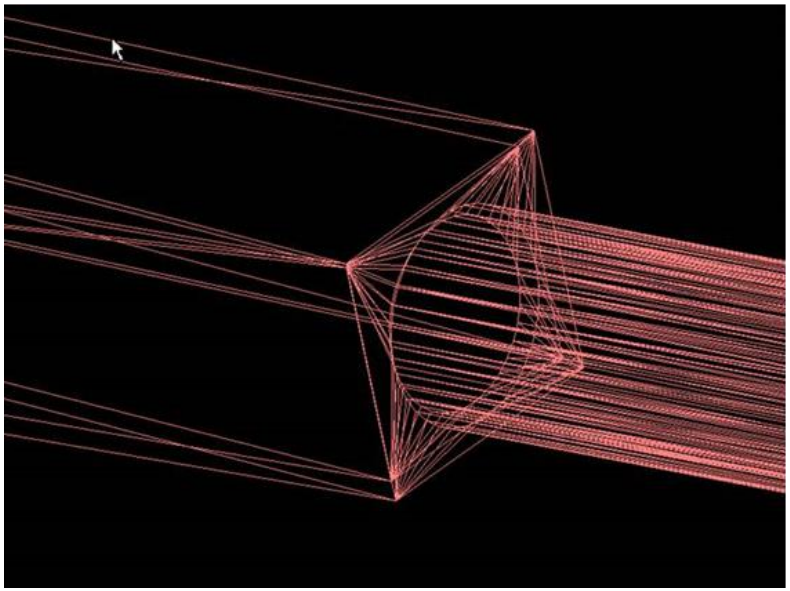


CAD model

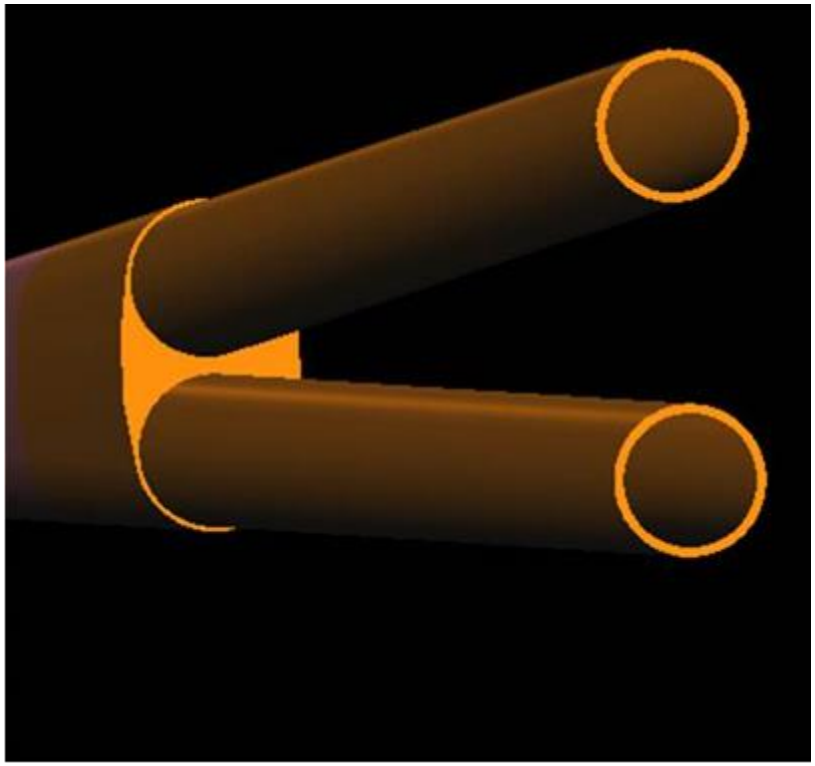
- The CAD model is much complex than the models we use currently in the calculations.
- It may have several layers, contain various elements.
- The right CAD model allows to change easily the dimensions if needed, add new elements and in general, it can be easily modified.
- We need such a model to optimize the IR geometry, the position and the size of the absorber to make the IR impedance as small as possible.

CAD model. Starting point. Miguel Gil Costa

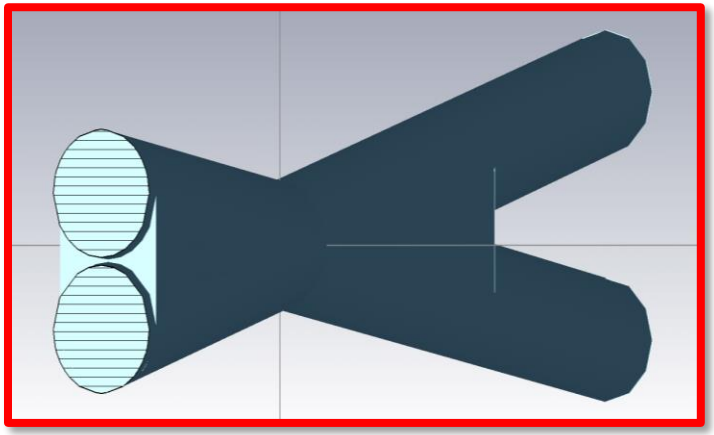




Next update



Eleonora model



We may discuss several items, pointed out by Miguel

First of all, sorry again for my long delivery times… The installation of the FCC-hh test-line will be done beginning of April and we are extremely busy with this matter, but this should not be an excuse…

Attached you can find two new STP files. One is aiming to show the "ideal" shape for your simulations. The second one is more fabrication-friendly design, done with geometries that are normally feasible on those materials. However, please keep in mind that both of these models are NOT FABRICATION MODELS, but just models to allow simulation using the inner surfaces and to try to use them as a common studied geometry.

In order to improve the models, more inputs are also needed, so if you could give me a bit more information, I will be happy to continue developing the models. Here you have some examples:
- Available surrounding space for extra-equipment (need of space for cooling system, BPM, HOM, flanges, …)
- Areas to be cooled down
- HOM definition

In any case, I am sure that last week of April, when Alexander will be at CERN, we will have a good opportunity to push a bit faster this development!

I am aware that you have studied several options before choosing a Be-Cu chamber. However, I would like to remark that as far as I know the Be-Cu welding is not yet well developed. So far I only heard about Be-to-CuCrZr bonding for ITER. Moreover, the possible vapours generated are highly toxic, which makes this joint very risky. On the other hand, Cu-Aluminium joints have been longer used are represent a lower risk. In any case, we can go further in detail in the future, once we go further on the fabrication model.