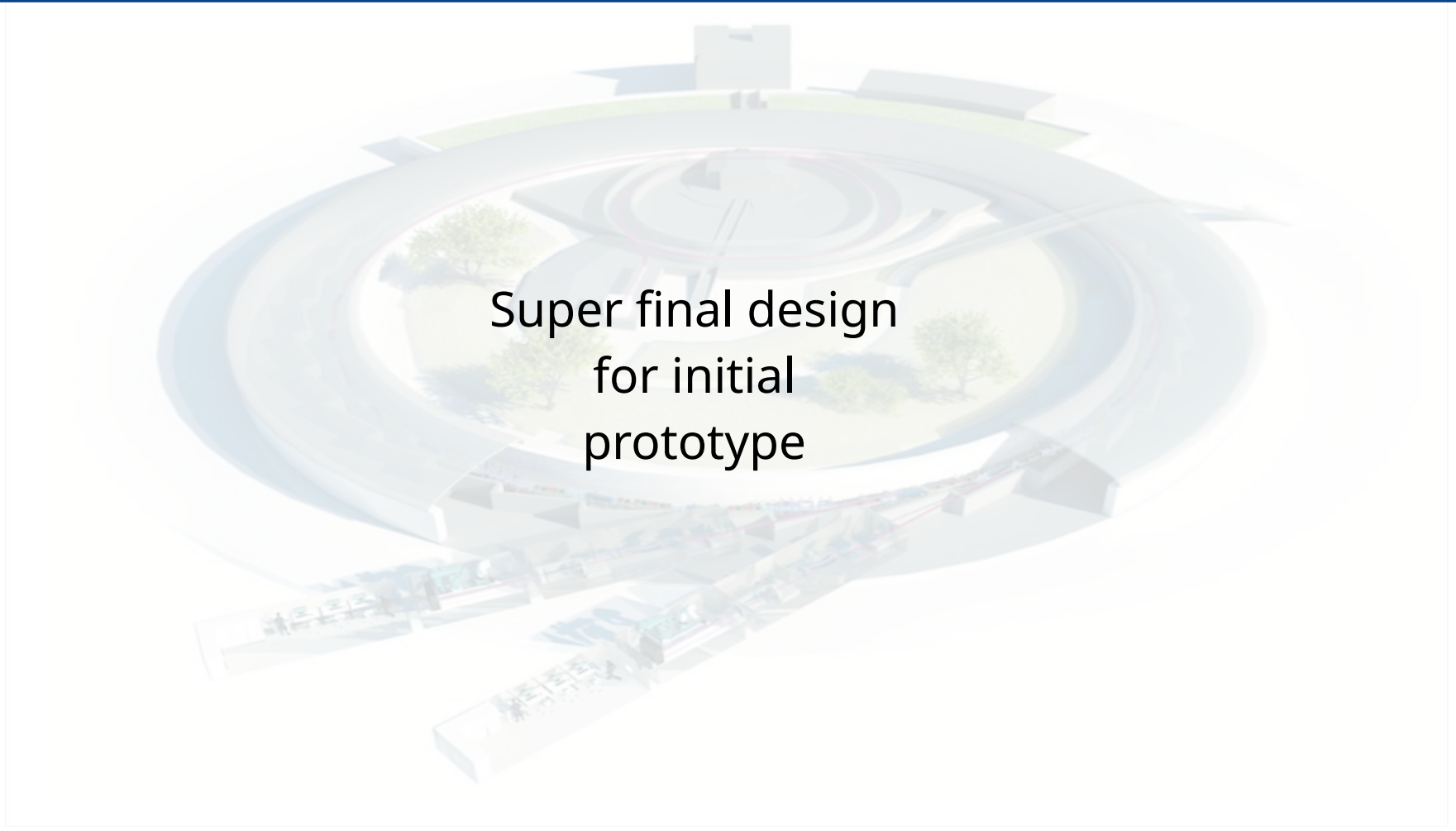
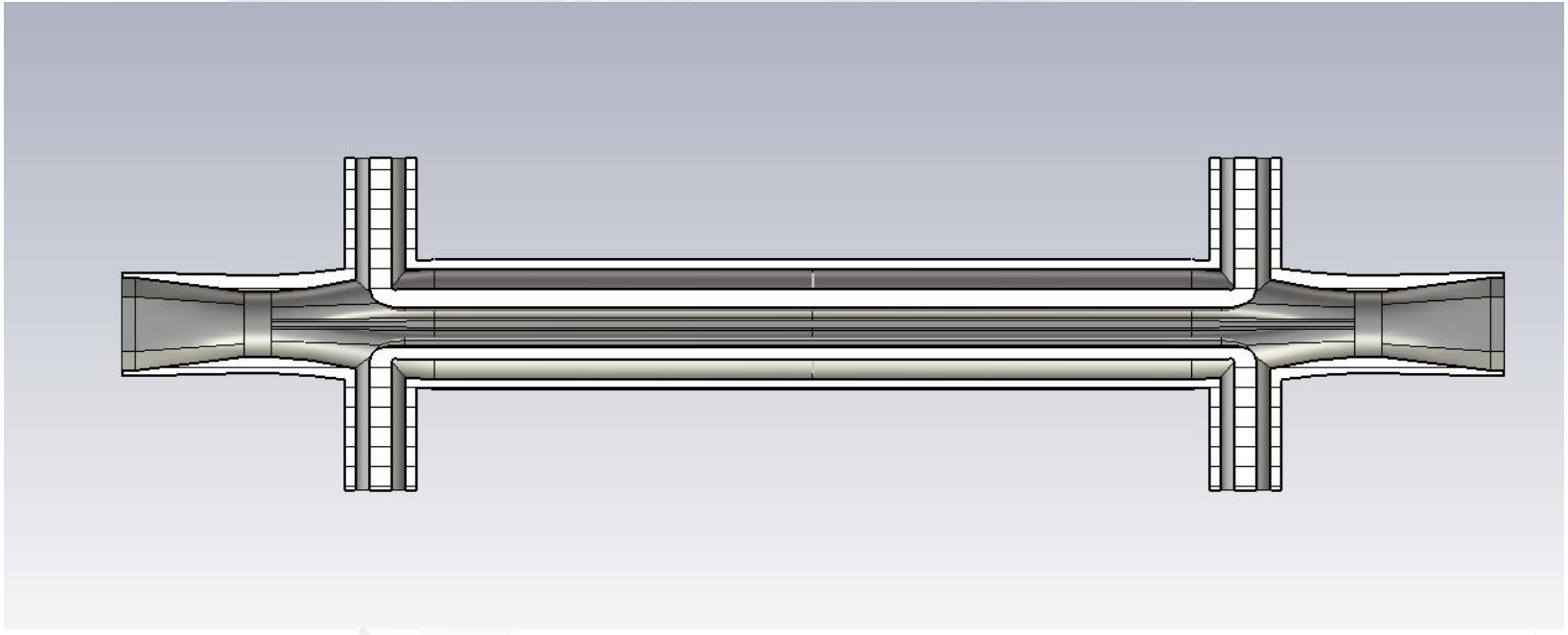
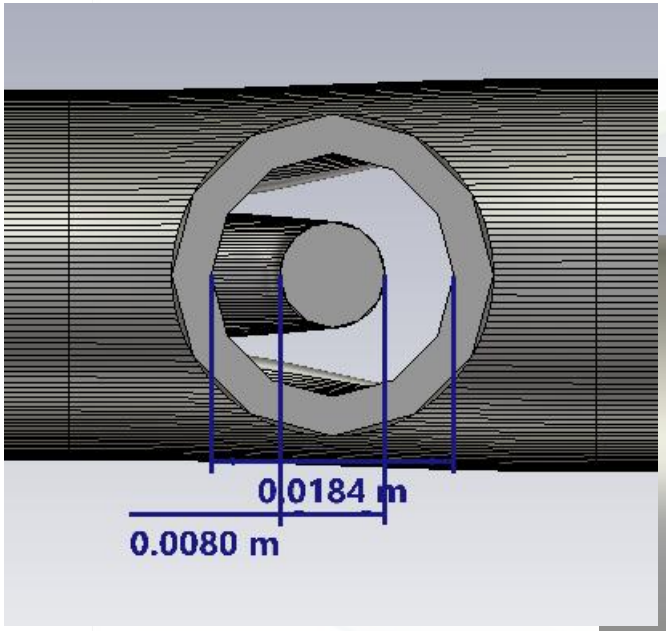


Super final design
for initial
prototype

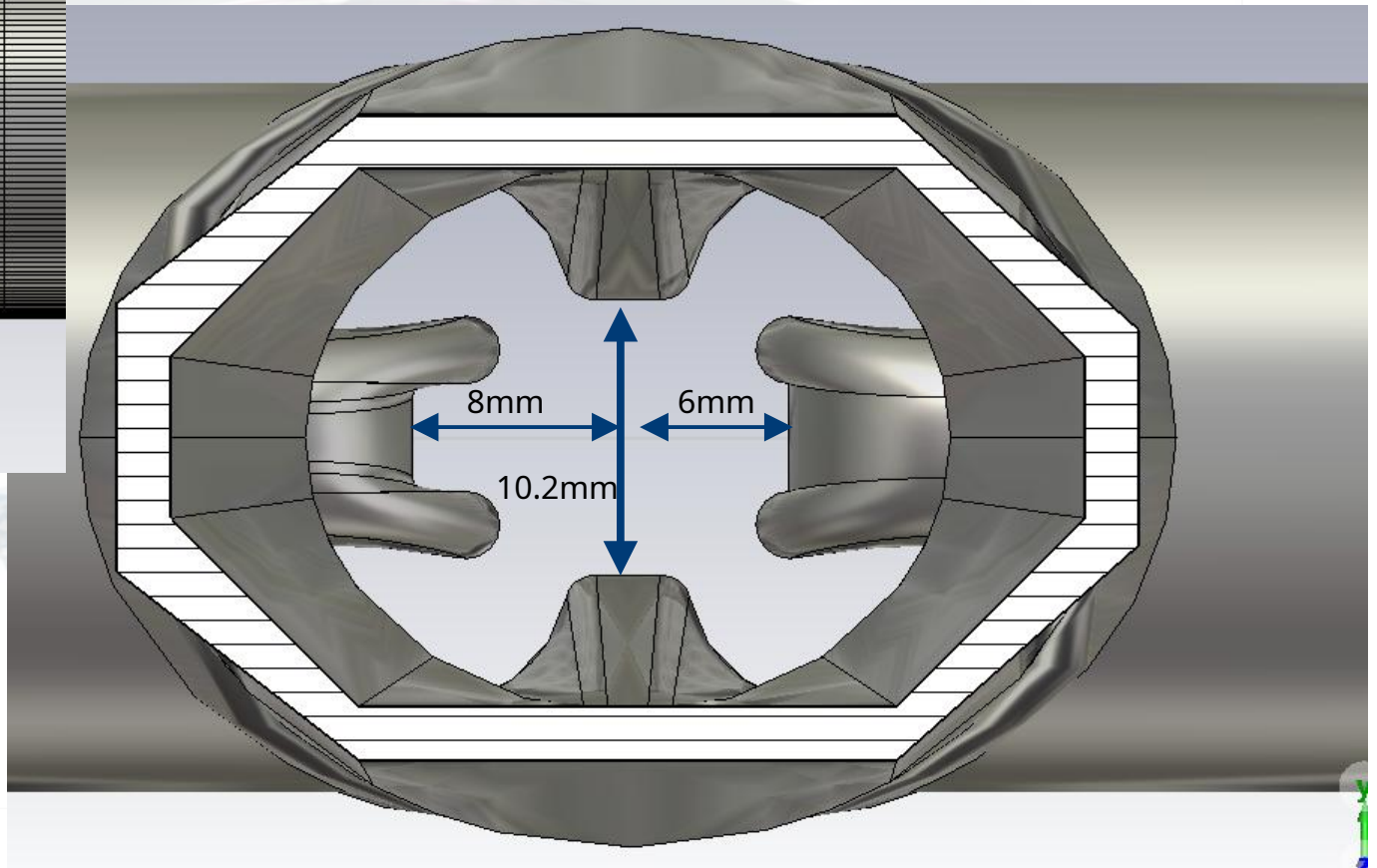
The device: we are looking for a solution with 3D printing and the feed_through (FT) holding the blades (no supports). FT still to be designed.





Connector

Beam stay clear. Assymetric to optimise minimize blade spacing and keep SR fan clearance of 2mm

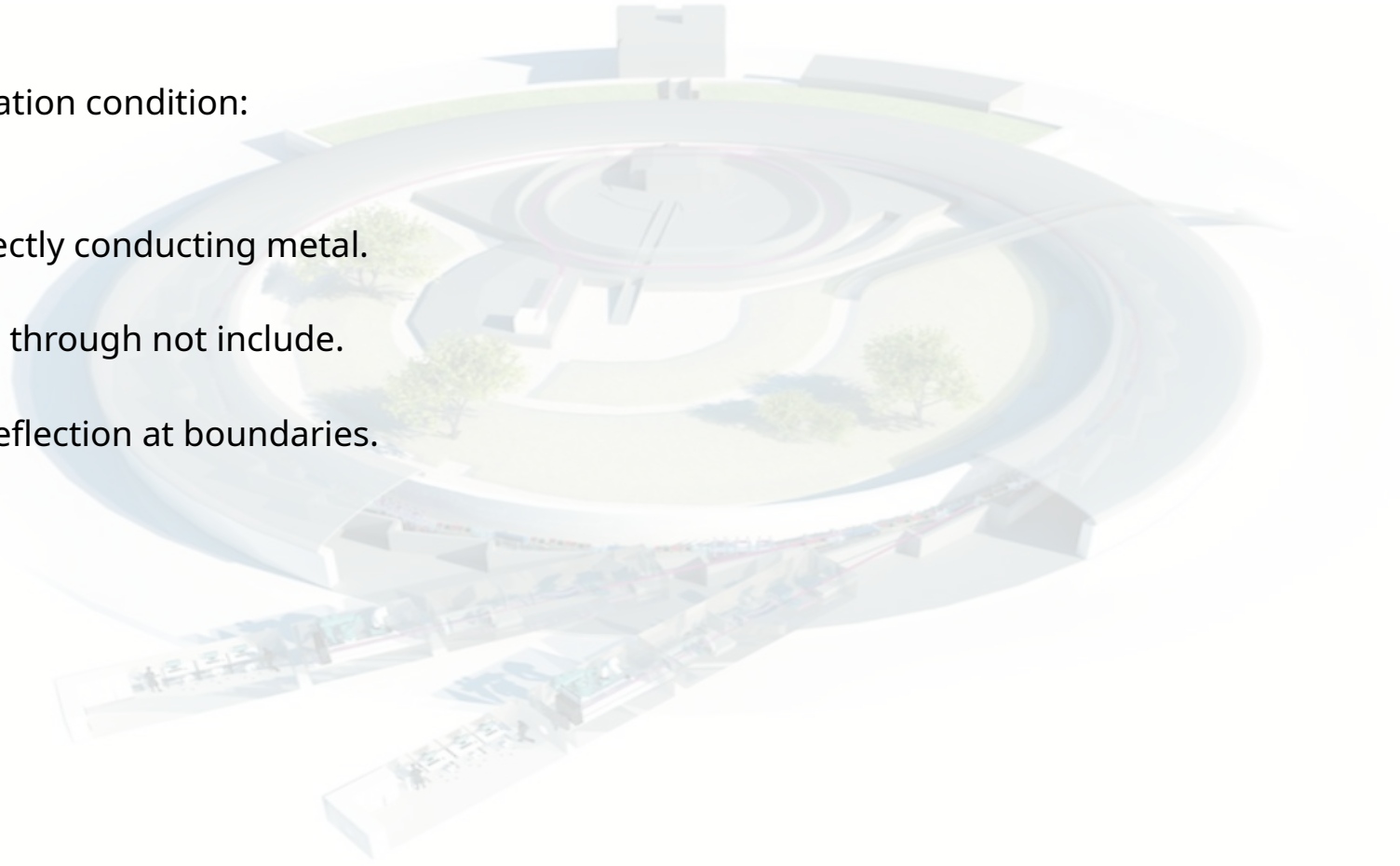


Simulation condition:

- Perfectly conducting metal.

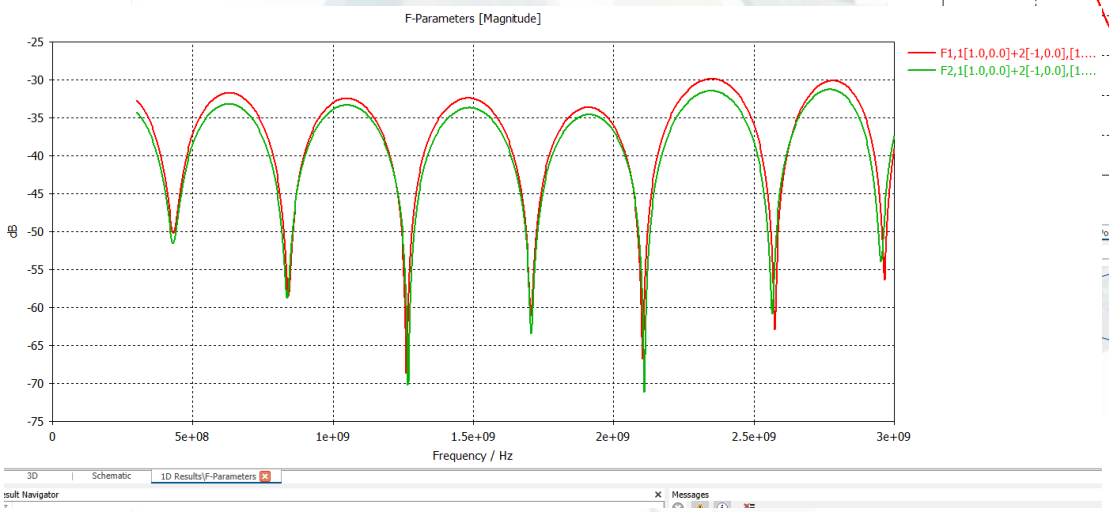
- Feed through not include.

- No reflection at boundaries.



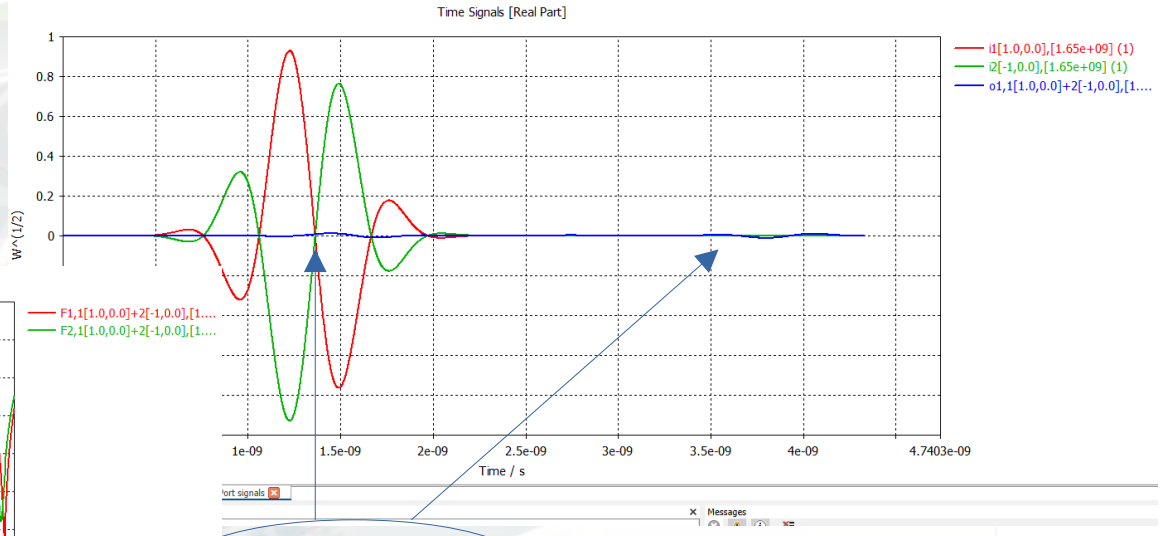
Odd modes (pulse transmission)

Frequency



Below 30dB up to 3 GHz

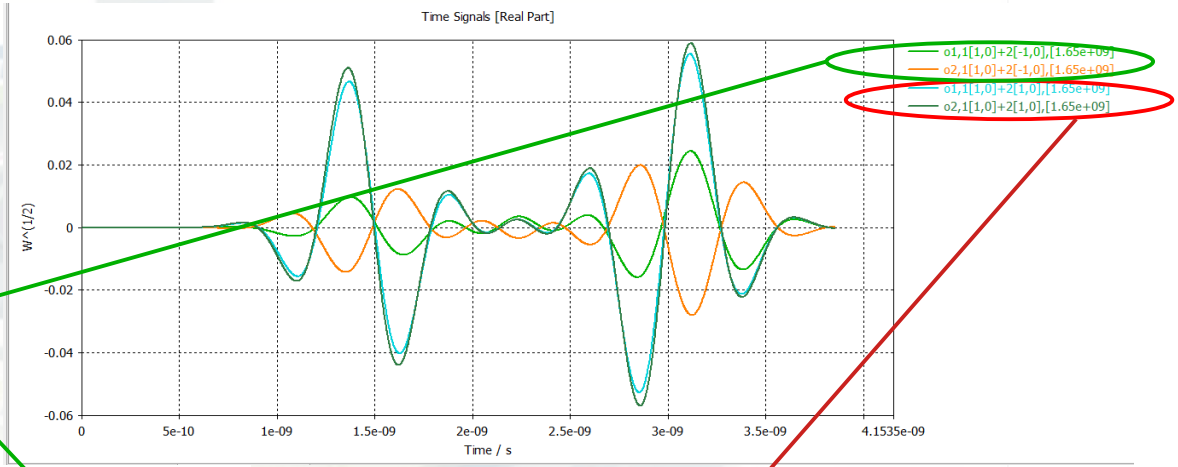
Time



Signal reflection is below 2%. Most of the contribution comes from the 90 deg bend at the transition between coaxial connector and blade close to the beam axis.

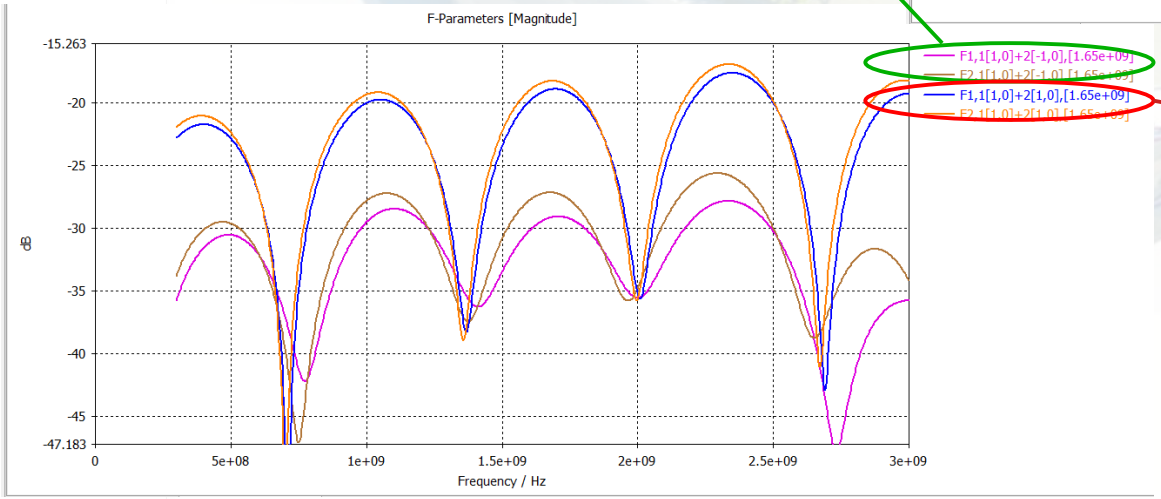
For Odd mode (the most important one) reflection below 25dB up to 3 Ghz.

For even mode below 16dB on same Frequency range.



Odd Mode

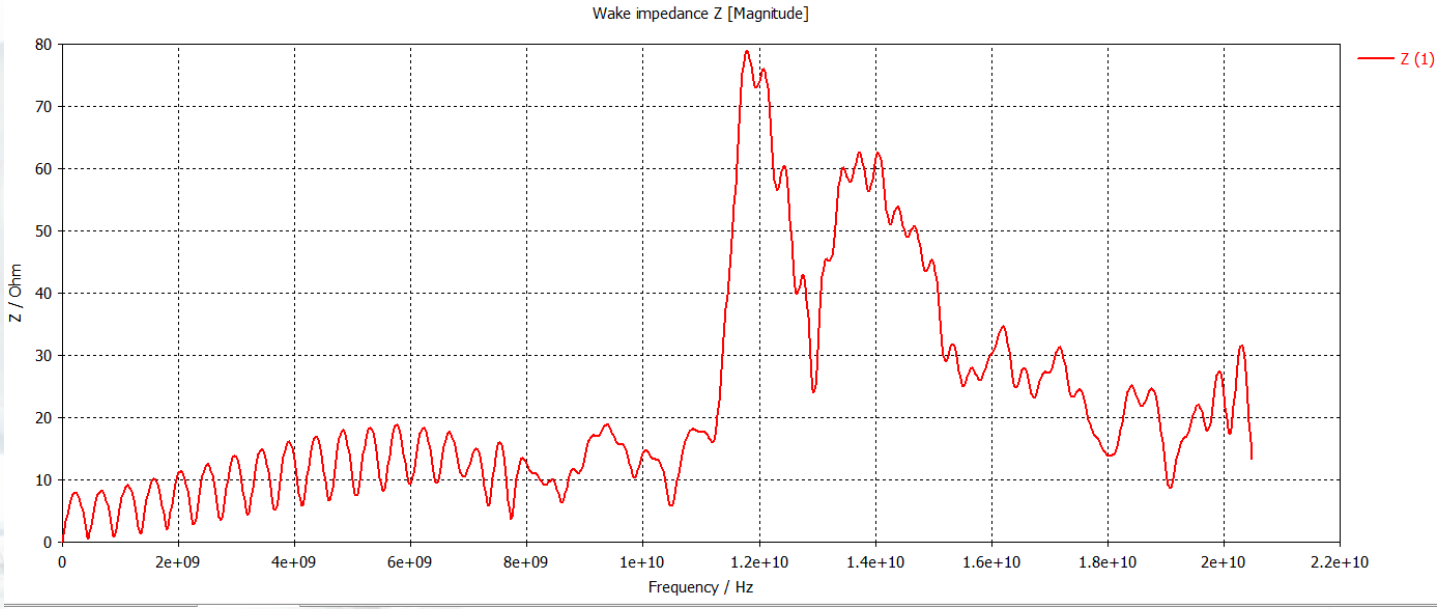
Even Mode



Impedance spectrum

Longitudinal only

For a 5mm bunch 1m wake integration, $k_{\parallel}$ ~=1.5E-1 V/pc

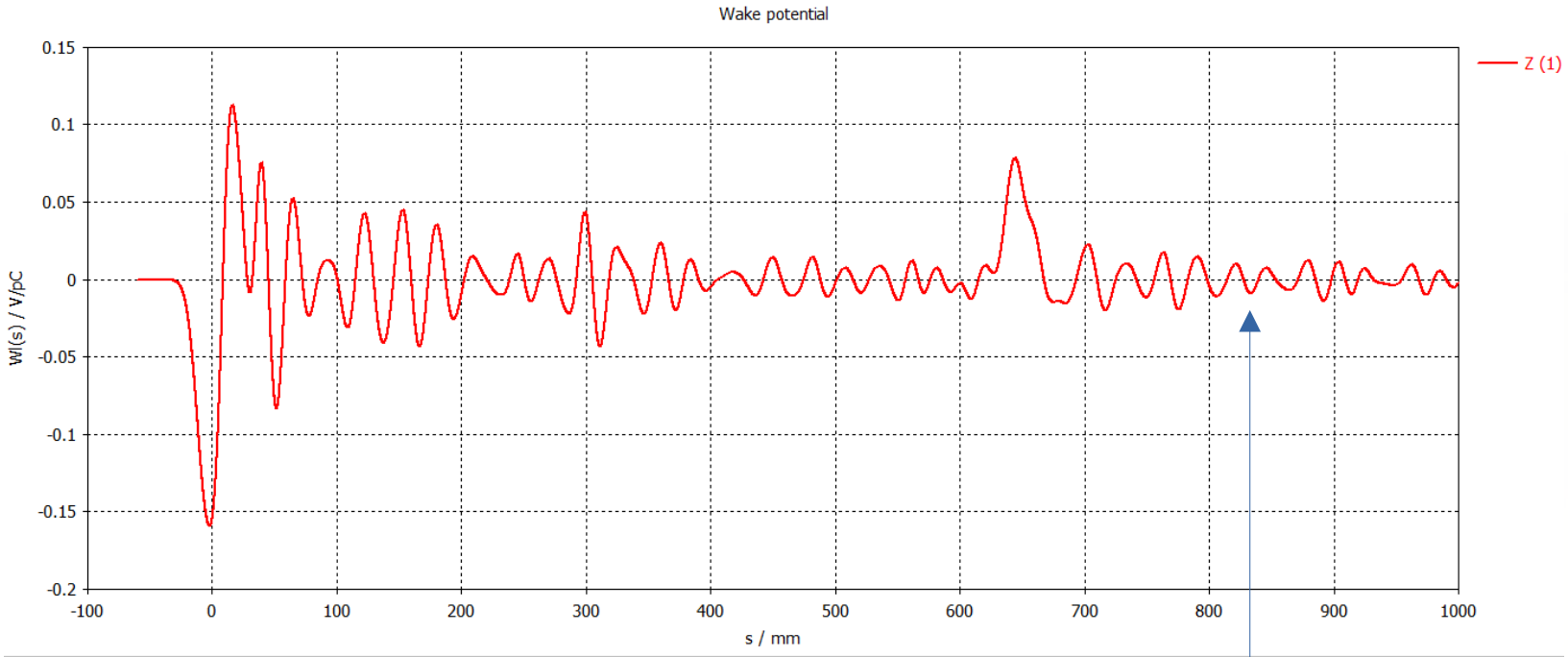


Power deposition in 16b~= 250W (a lot)

$k_{\parallel}$ for a 1.2cm bunch=4.3E-2 V/pC: P_{16b}~=: 70W (still a lot)

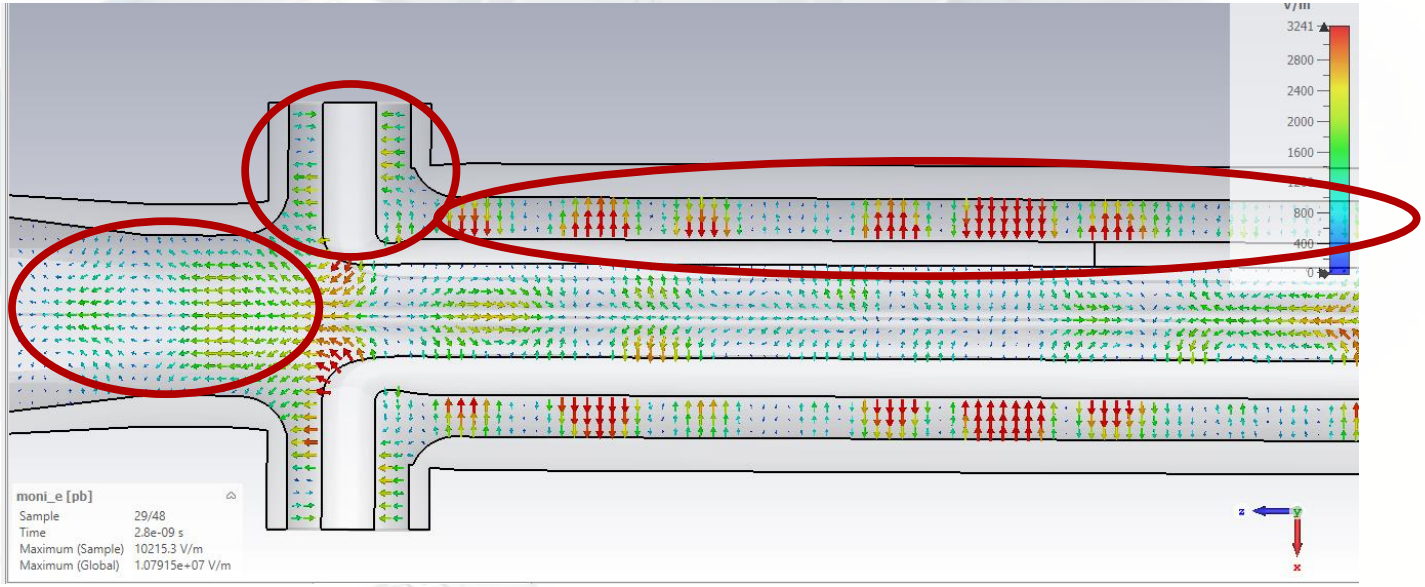
Large power deposition. The power deposited on the chamber is easy to extract, the power deposited on the blades is the problem.

Impedance wake



Next bunch arrival. Can it build up????

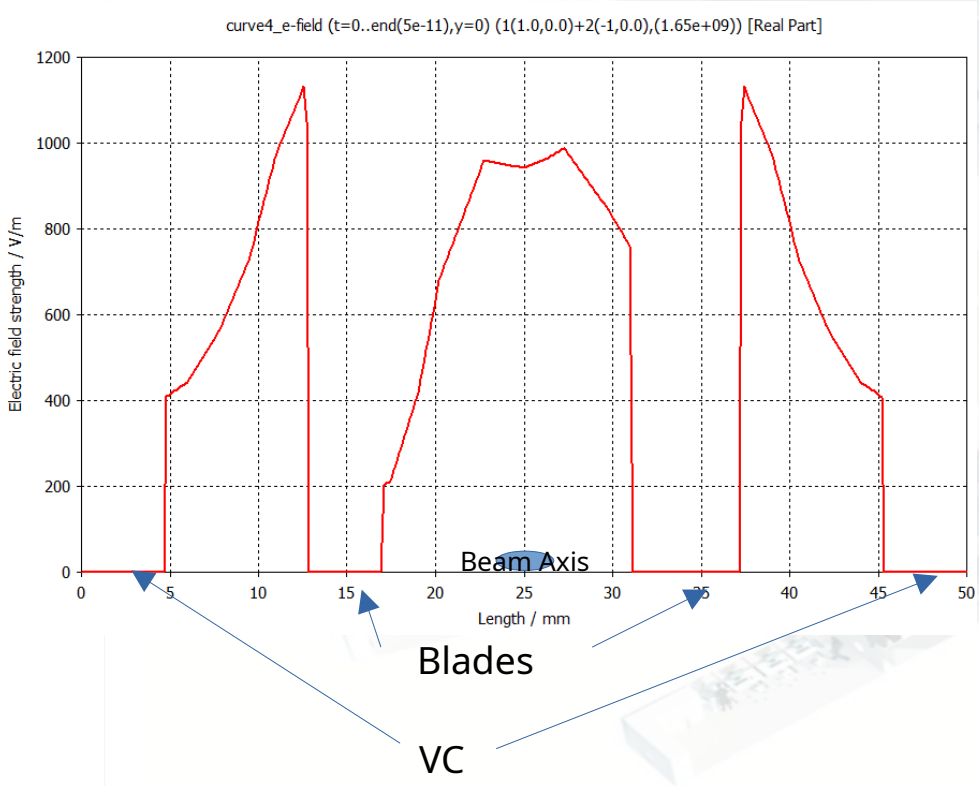
Traped modes:



Specific study still to be addressed.

Field profile in the center of the device

Field profile between blades in the center of the structure (z=0):

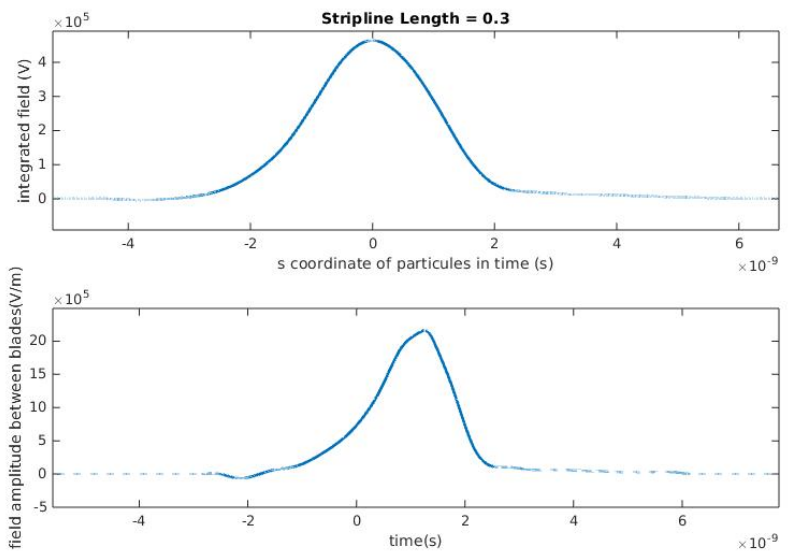


Exemple:

-2*15Kv pulser with the waveform of the device we have in house (2ns fwhm).

-30cm long SL:

Integrated kick is: 0.155 mrad for a 6Gev beam.



If SL are installed in ID06 we need a 0.6 mrad kick to inject. Considering redundancy and margin in strength we would need 6 of the previous devices or:

-10-11 devices of 20cm each fed with +-10KV

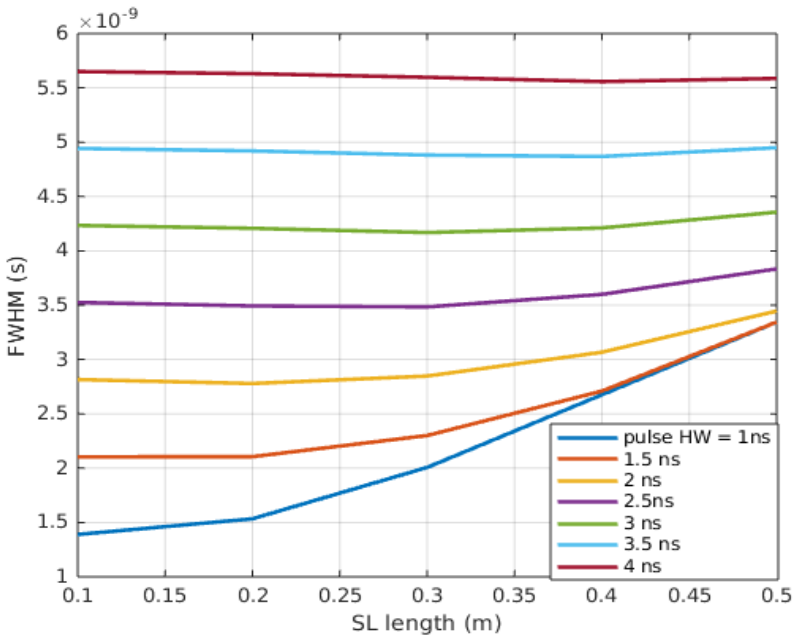
- 9 devices of 30cm fed with +-10KV

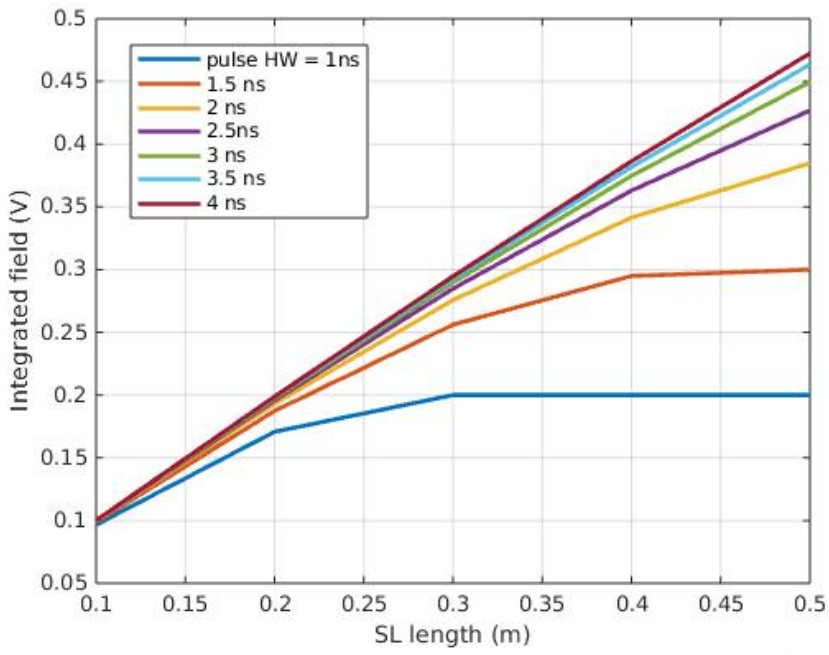
- 6 devices of 30cm fed with +-15Kv

- 7 devices of 20cm fed with +-15Kv
etc.....

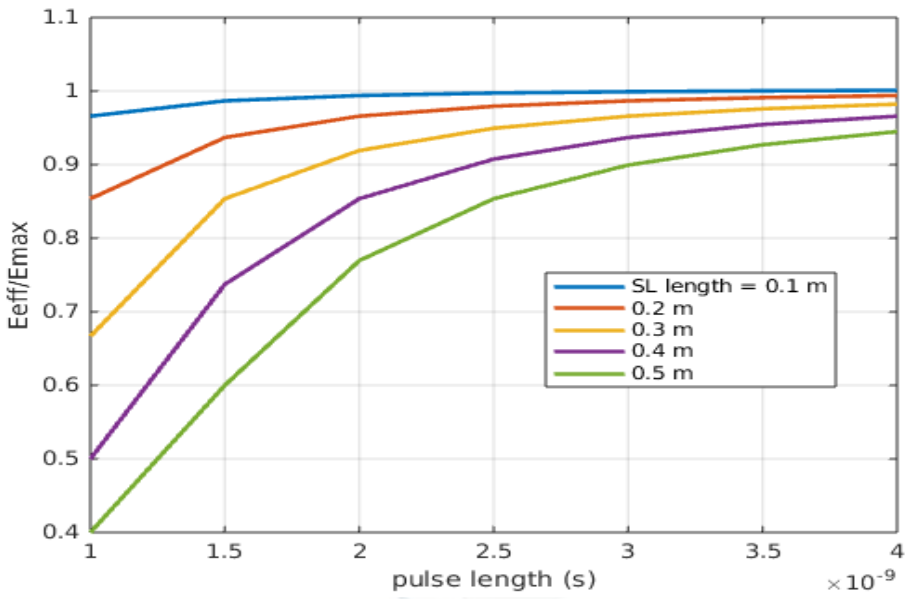
Trend between speed and strength, and HV optimisation.

The pulse and the beam travel in opposite directions, therefore the beam does not probe only the peak of the pulse. The “effective” voltage seen by the beam depends on the pulse width and the SL length. The optimum situation will be a trend between speed strength available space and HV .





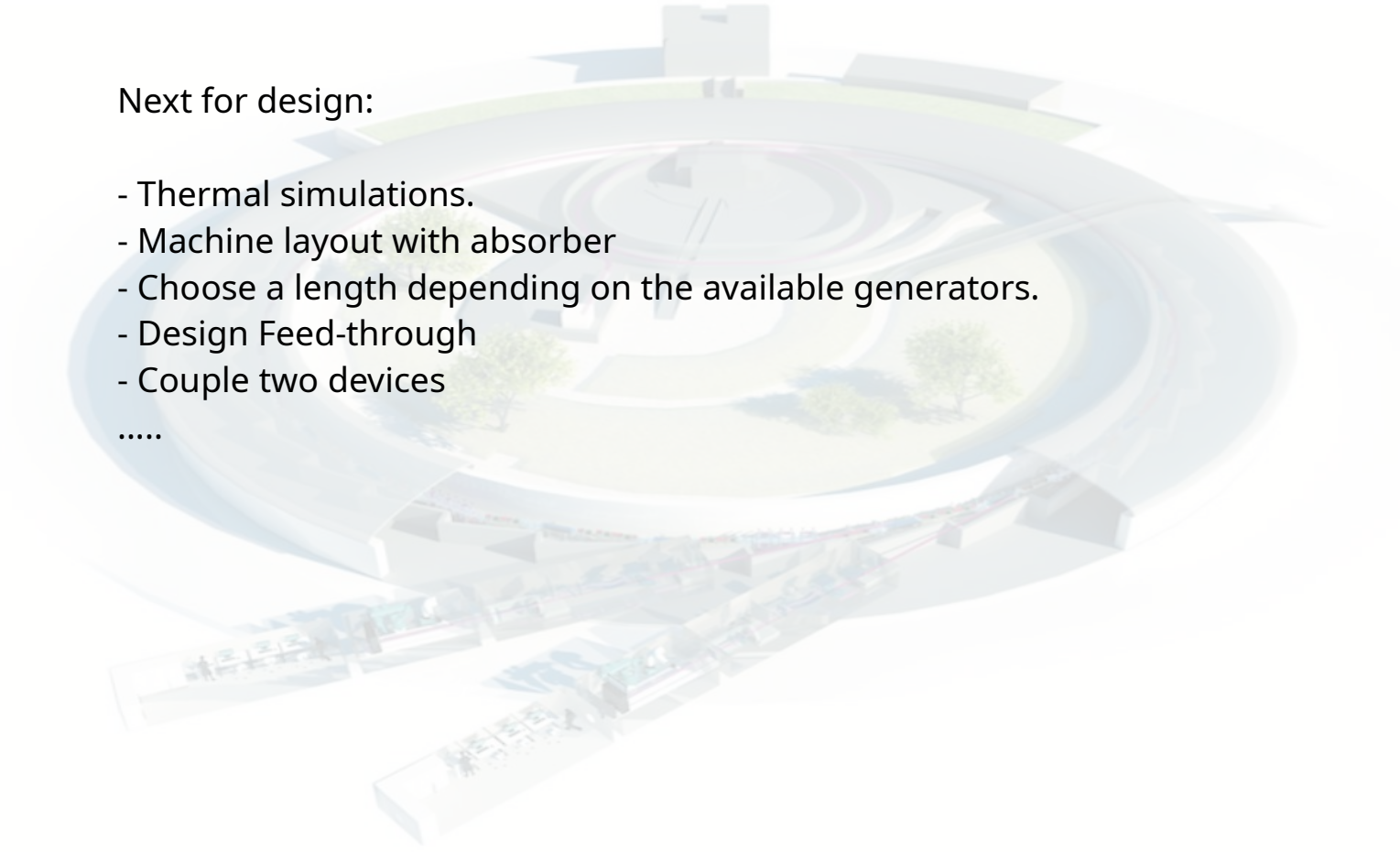
If you have a mismatch between SL length and pulse length the HV is not optimised.



Next for design:

- Thermal simulations.
- Machine layout with absorber
- Choose a length depending on the available generators.
- Design Feed-through
- Couple two devices

.....



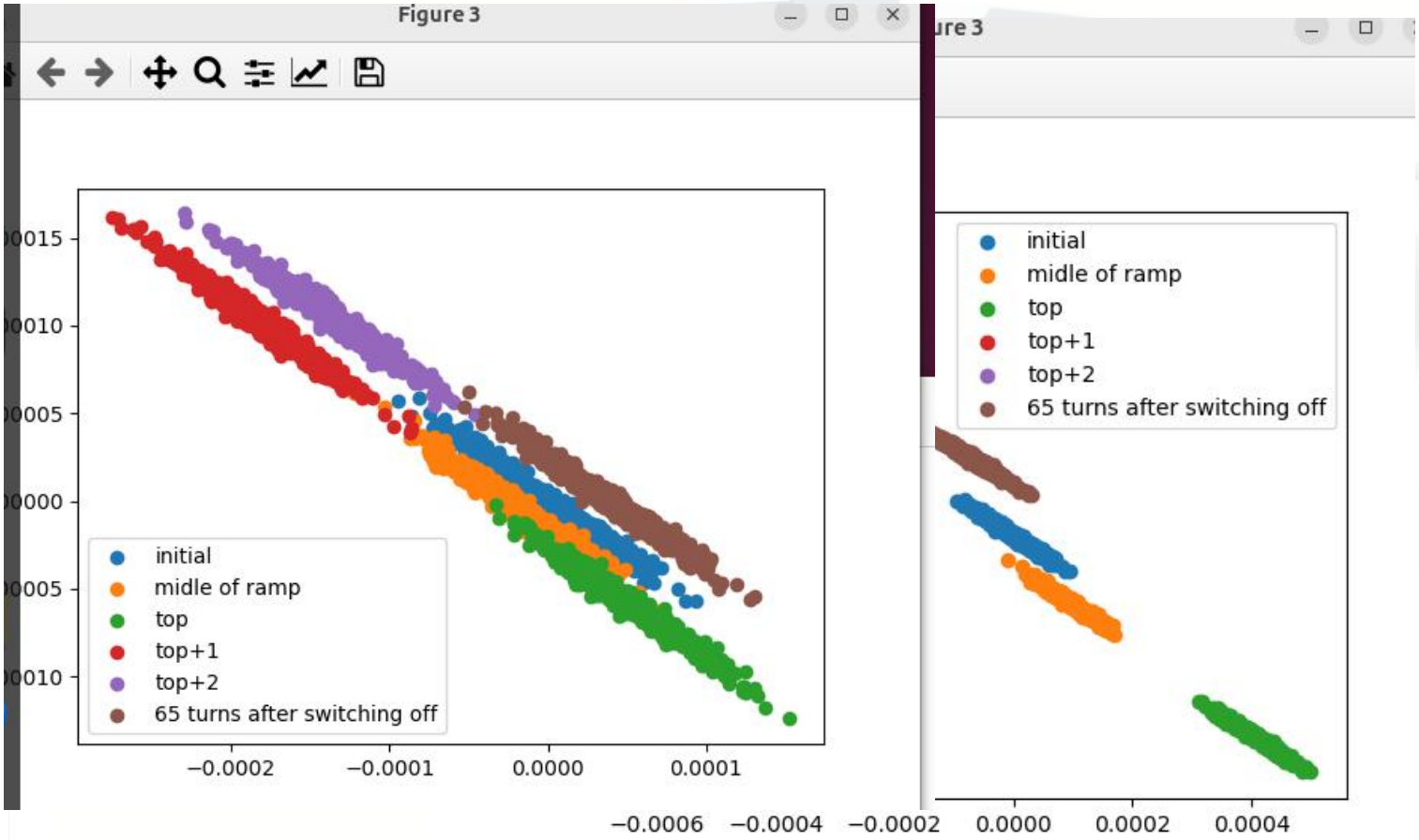
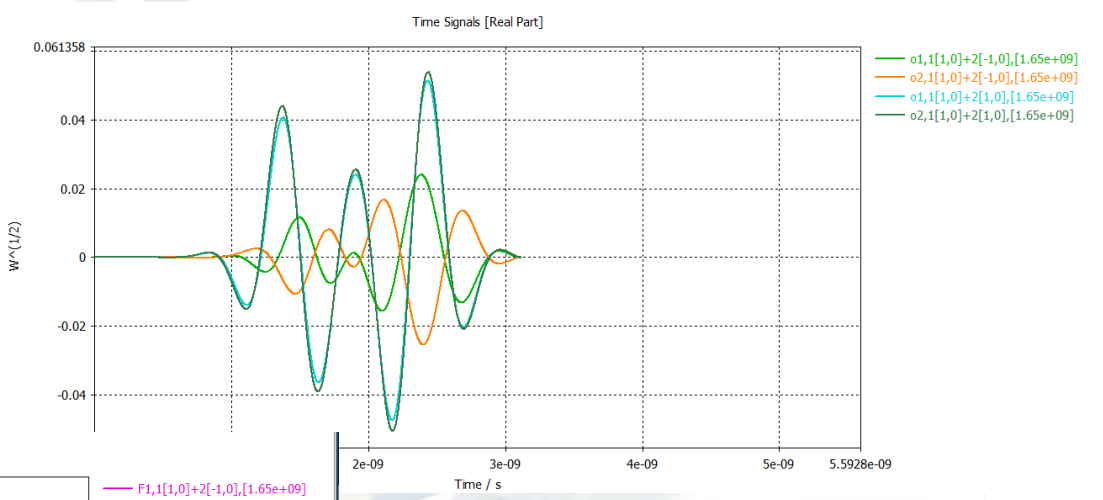
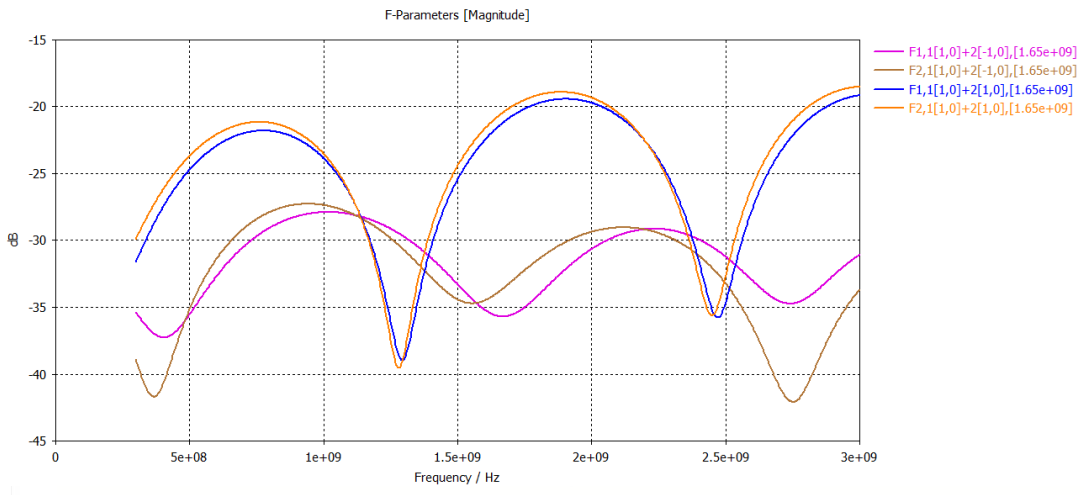


Figure 3
initial
midle of ramp
top
top+1
top+2
65 turns after switching off
−0.0002
−0.0001
0.0000
0.0001
−0.0006
−0.0004
−0.0002
0.0000
0.0002
0.0004

Version 4


Time Signals [Real Part]
0.061358
0.04
0.02
0
-0.02
-0.04
W^(1/2)
2e-09
3e-09
4e-09
5e-09
5.5928e-09
Time / s
o1,1[1,0]+2[-1,0],[1.65e+09]
o2,1[1,0]+2[-1,0],[1.65e+09]
o1,1[1,0]+2[1,0],[1.65e+09]
o2,1[1,0]+2[1,0],[1.65e+09]


F-Parameters [Magnitude]
-15
-20
-25
-30
-35
-40
-45
dB
0
5e+08
1e+09
1.5e+09
2e+09
2.5e+09
3e+09
Frequency / Hz
F1,1[1,0]+2[-1,0],[1.65e+09]
F2,1[1,0]+2[-1,0],[1.65e+09]
F1,1[1,0]+2[1,0],[1.65e+09]
F2,1[1,0]+2[1,0],[1.65e+09]