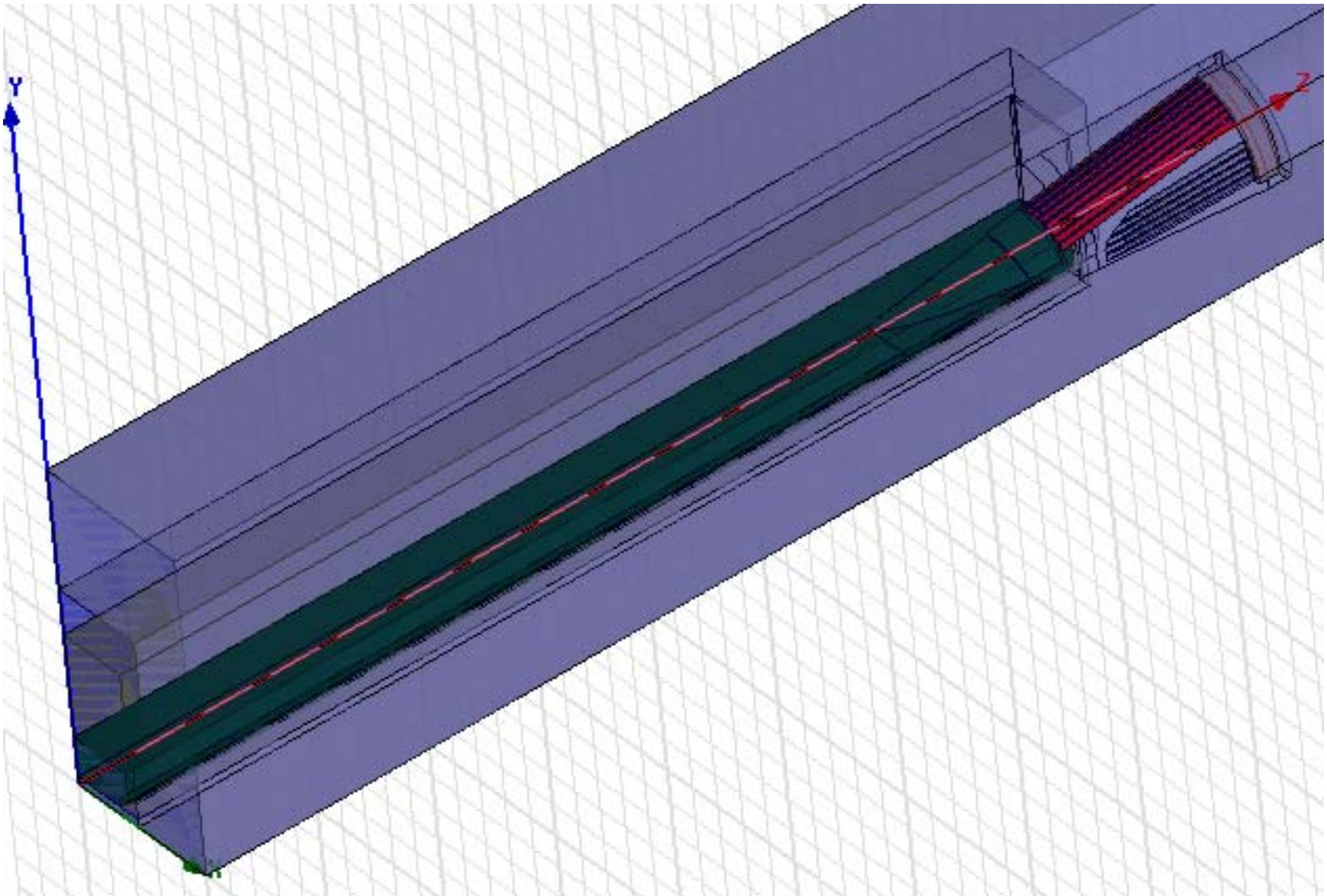
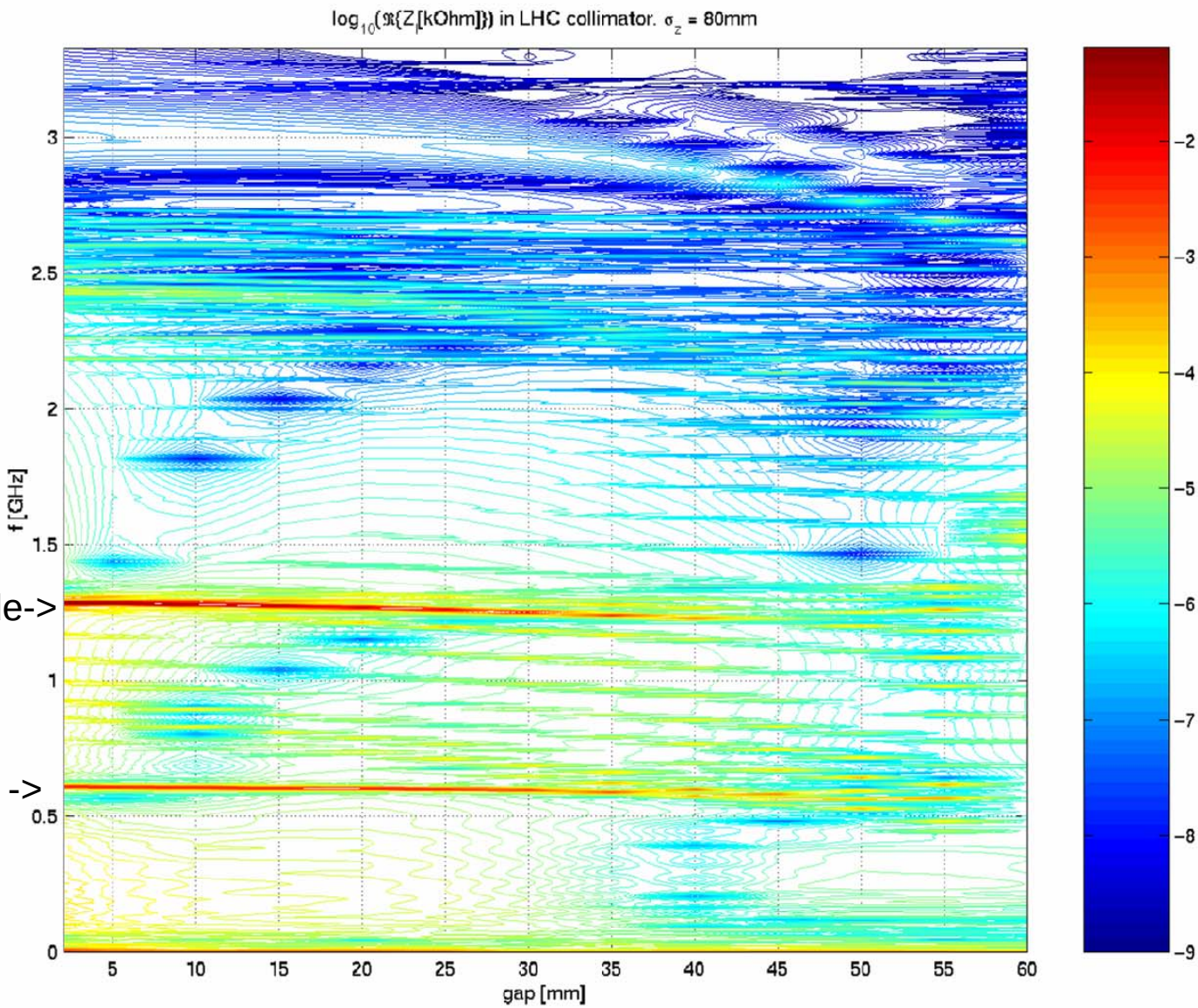
Simulation of Monopole modes trapped in LHC collimator

A.Grudiev

LHC collimator geometry in HFSS



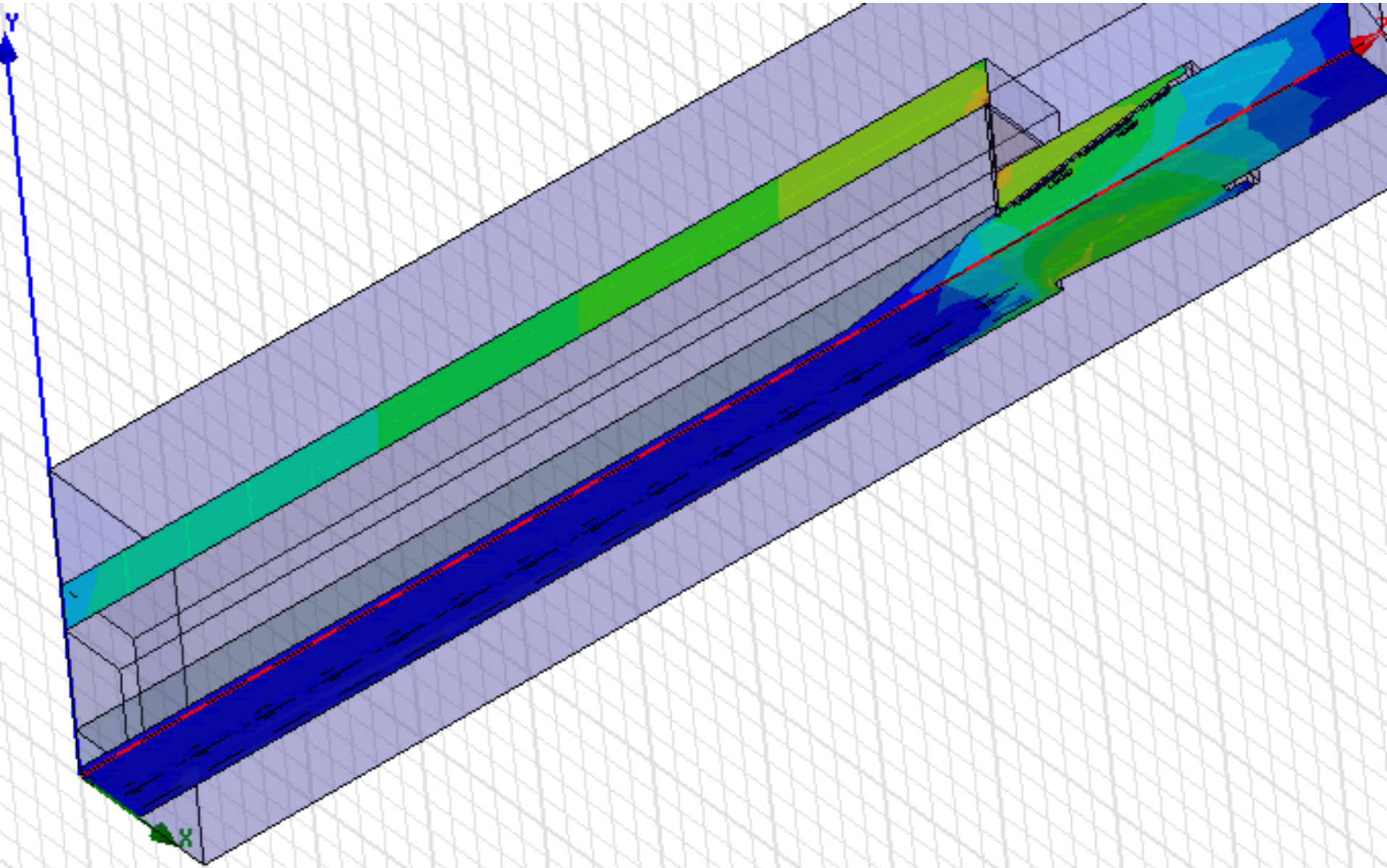
Time domain simulation with GdfidL



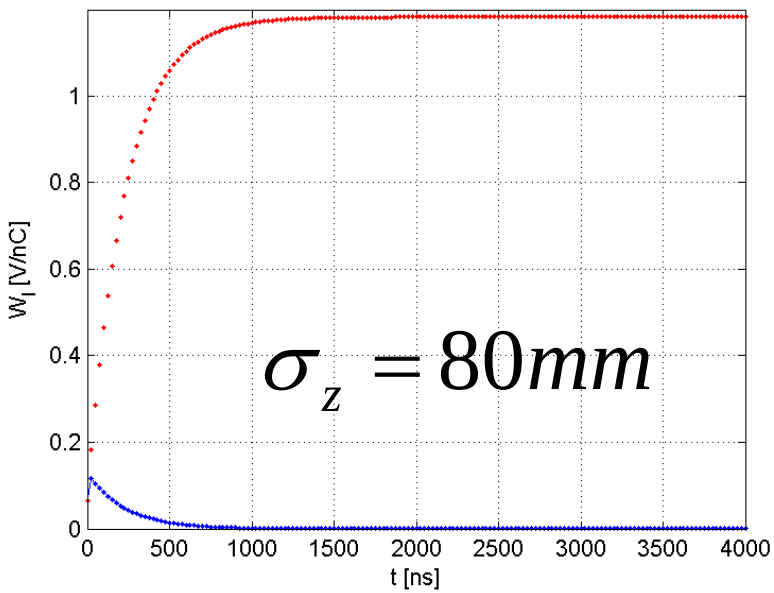
Second mode->

First mode ->

Electric field of the first mode in log scale (gap=10mm)



First bunch (blue) and total wake (red) along the train for the first mode



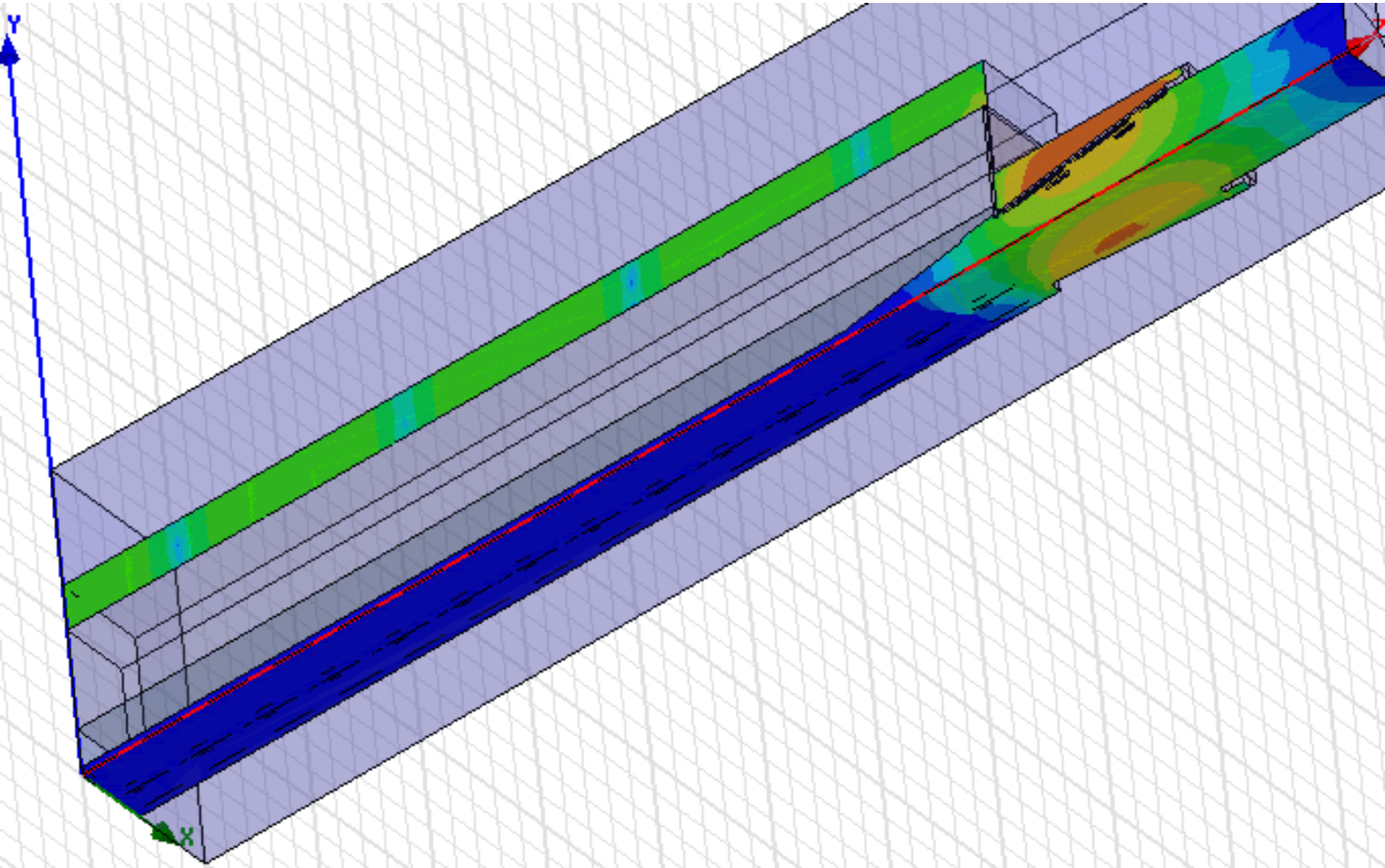
f=0.6GHz
(15th-harmonic of bunch frequency)
Q=136
r/Q = 0.1 Ohm (accelerator impedance)
k = 0.13 V/nC (loss factor)

For $\sigma_z = 80\,mm$
Max. single bunch energy loss:
1.2V/nC x 16nC = 19V

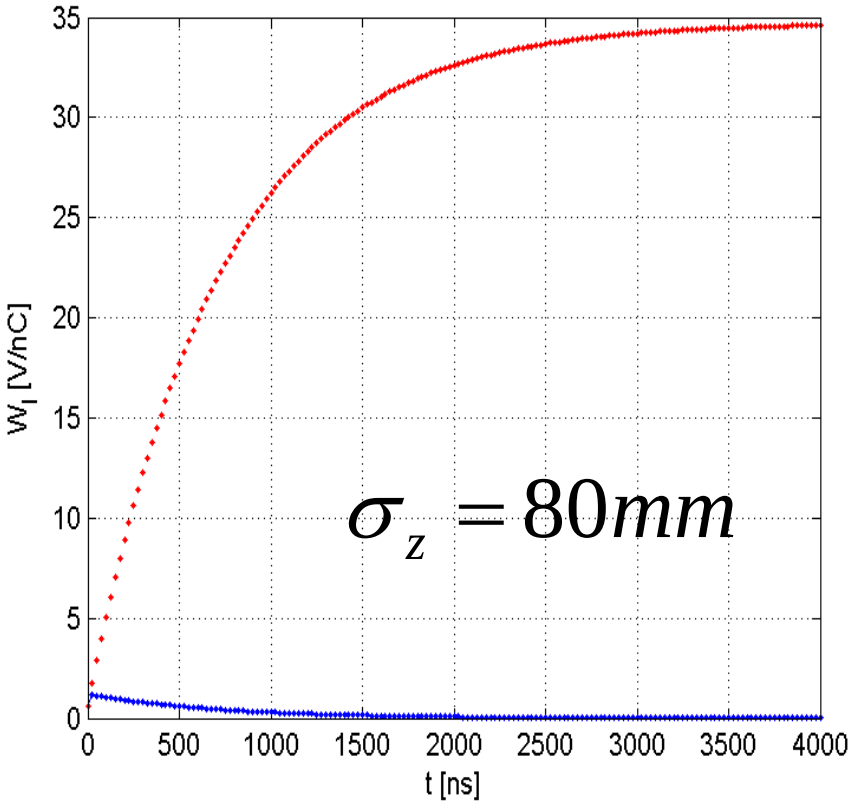
Total energy loss per train:
dE = 0.85 mJ

Dissipated power: dE x frev = 10 W

Electric field of the second mode in log scale (gap=10mm)



First bunch (blue) and total wake (red) along the train for the second mode



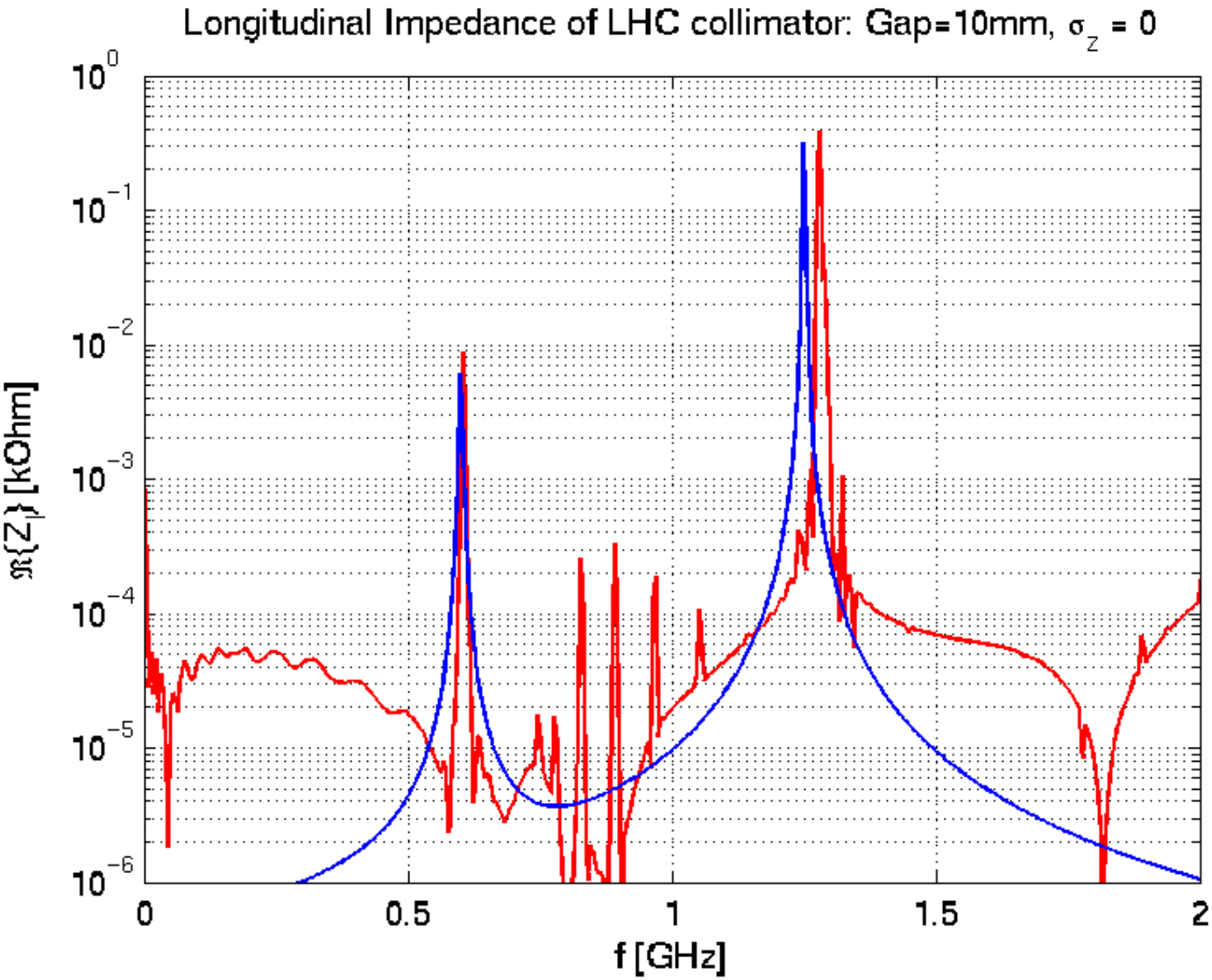
f=1.24GHz
(31st-harmonic of bunch frequency)
Q=892
r/Q = 2.67 Ohm (accelerator impedance)
k = 5.2 V/nC (loss factor)

For $\sigma_z = 80\,mm$
Max. single bunch energy loss:
35V/nC x 16nC = 560V

Total energy loss per train:
dE = 24.7 mJ

Dissipated power: dE x frev = 278 W

Longitudinal impedance calculated using Gdfidl (red) and HFSS (blue)



Geometrical longitudienal short-range wake in LHC collimator