Model Construction

The dipole antenna should operate at 1 GHz, which returns a total length of 150 mm. The antenna is modeled as a metallic cylinder with 150 mm of length and 5 mm of diameter. A second cylinder made of vacuum is inserted (Boolean operation) to the first one, to create a gap of 20 mm. The parameter list of the model is shown in Table 1.

Table 1. Parameter list of the dipole

Parameter	Value	Description
L	150 mm	Initial dipole length (lambda/2)
Gap	20 mm	Feeding gap of the antenna
D	5 mm	Diameter of the conductor
Z0	73 Ohms	Port impedance

In Fig. 8 we see the template summary to be used in this project.

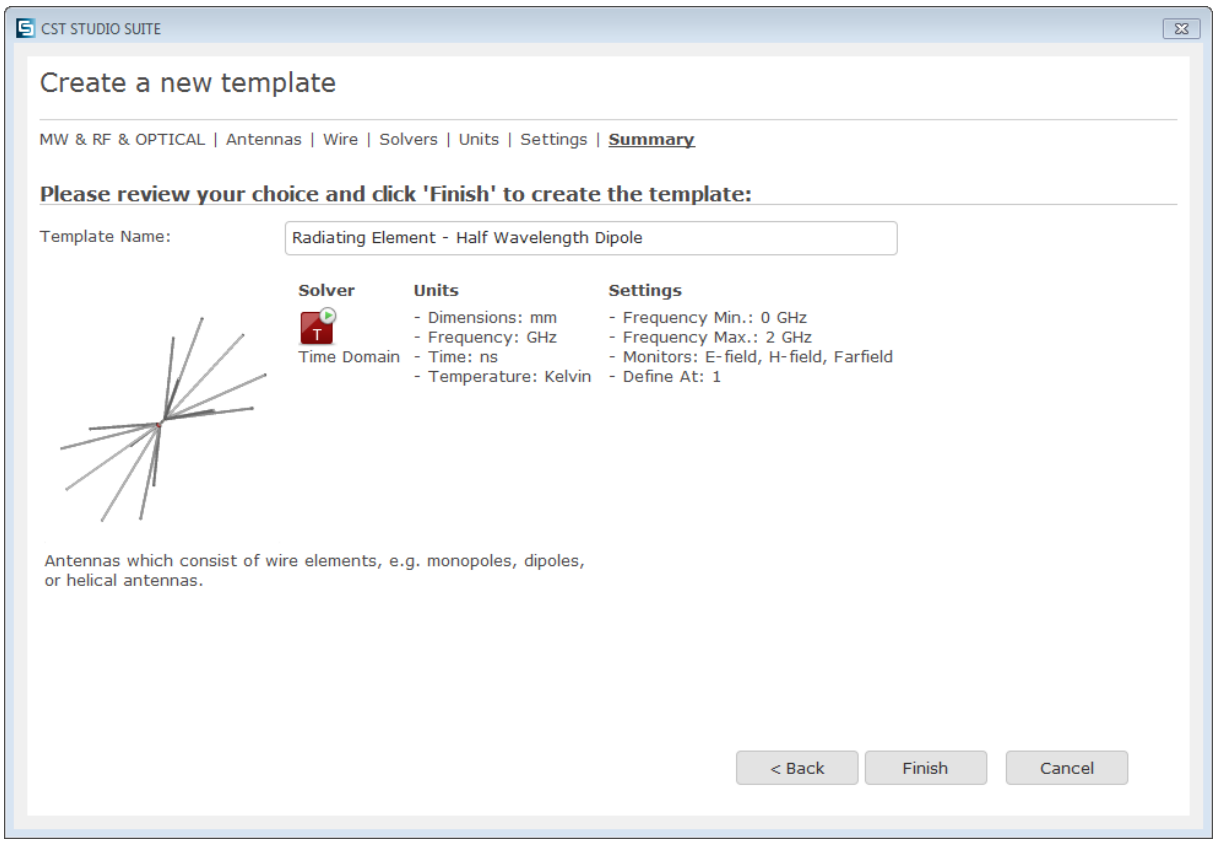

Figure 8: Summary of the project template for the simulation of a half wavelength dipole antenna at 1 GHz.

A PEC cylinder is created with the full length of the antenna L (Fig. 9) and diameter D, aligned with the Z-axis.

Figure 9: PEC cylinder to be used as the metallic part of the dipole antenna

The vacuum cylinder to be used as a gap is created with length Gap and diameter D, and inserted in the center of the previous shape as in Figure 10.

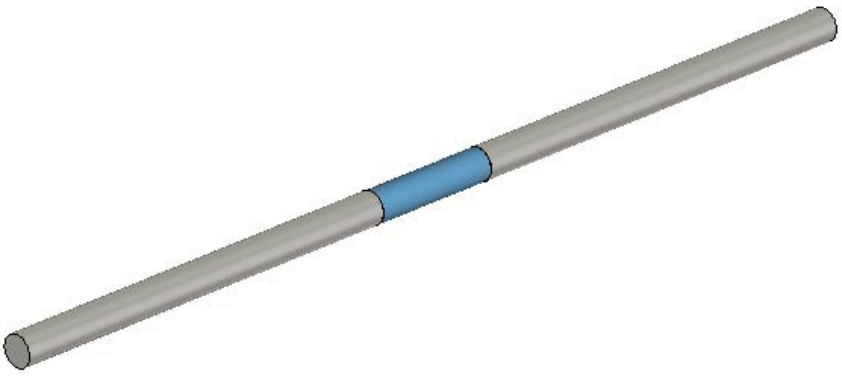

Figure 10: Vacuum cylinder (dummy object) created and inserted at the center of the previous PEC cylinder to create the gap of the dipole

A discrete face port is created by picking both inner edges of the metallic rod and its impedance is adjusted to Z0 (73 Ohms). The final model is shown in Fig. 11.

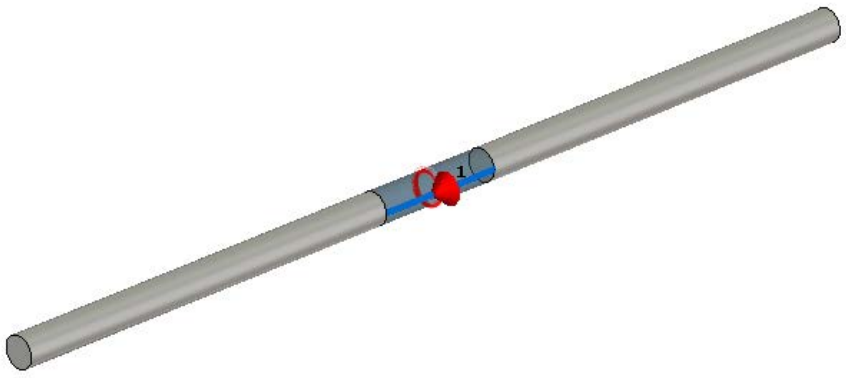

Figure 11: Final model of a half wavelength dipole antenna at 1 GHz

After the first run the S-parameter result will be shifted from 1 GHz, as shown in Fig. 12. In order to increase (decrease) the resonant frequency decrease (increase) the dipole length. Make a simple parameter sweep to confirm this behavior and tweak the dipole length to match the result shown in Fig. 4. The final parameter value should be close to 135.6 mm.

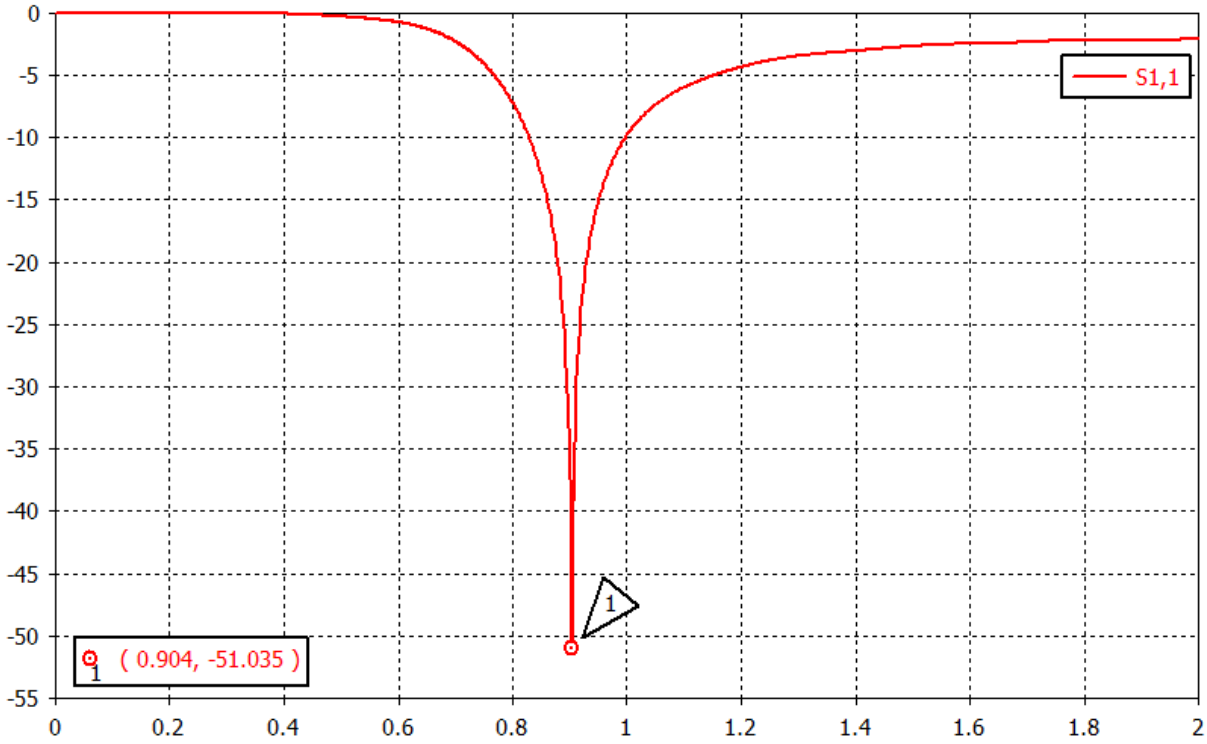

Figure 12: S-parameter result for L = 150 mm of the final model. An additional tweaking should be done in order to move the minimum to 1 GHz.