Virtual Lab 5 – Microwave Resonator

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# EEL4436C Microwave Engineering

Section 0012

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1. (20 pts) Report the results using Method 1. You need to present your own versions of structure drawing, field plots, convergence table, etc.

A green rectangular object with a black line

Description automatically generated

A screenshot of a computer

Description automatically generated

A screenshot of a graph

Description automatically generated

1. (20 pts) Report the results using Method 2 with all necessary details.
2. (20 pts) Report the results using Method 3 with all necessary details.
3. (10 pts) Report the Q factors due to three loss mechanisms. When you combine all three unloaded Q factors in parallel, does it agree with the total unloaded Q factor with Method 3?
4. (10 pts) In Method 4, you will use analytical formulas to calculate the *f0* and *Qu*. By today’s standard, it is no longer considered accurate. However, it is beneficial for you to see how things were done in the past and how accurate/inaccurate this method is. Find the effective dielectric constant of the microstrip line using the formula in the textbook and use it to estimate the resonant frequency of the half-wavelength resonator. This frequency is typically higher than the HFSS simulation results. The difference is due to the fringing field effect at the two ends of the resonator. The actual resonator is equivalent to an ideal transmission line loaded with two identical capacitors at both ends. Calculate the capacitance. In addition, you can find the using Pozar’s methods for the attenuation and the propagation constant. Follow example 6.2 in Pozar’s book. It is noted that radiation losses are not considered in this case.
5. (10 pts) You can also find the effective dielectric constant, attenuation and the propagation constants in HFSS Ports-only simulations. Report *f0* and using this method (Method 5)?
6. (10 pts) Compare the *f0* and by all 5 methods in a table and comment.