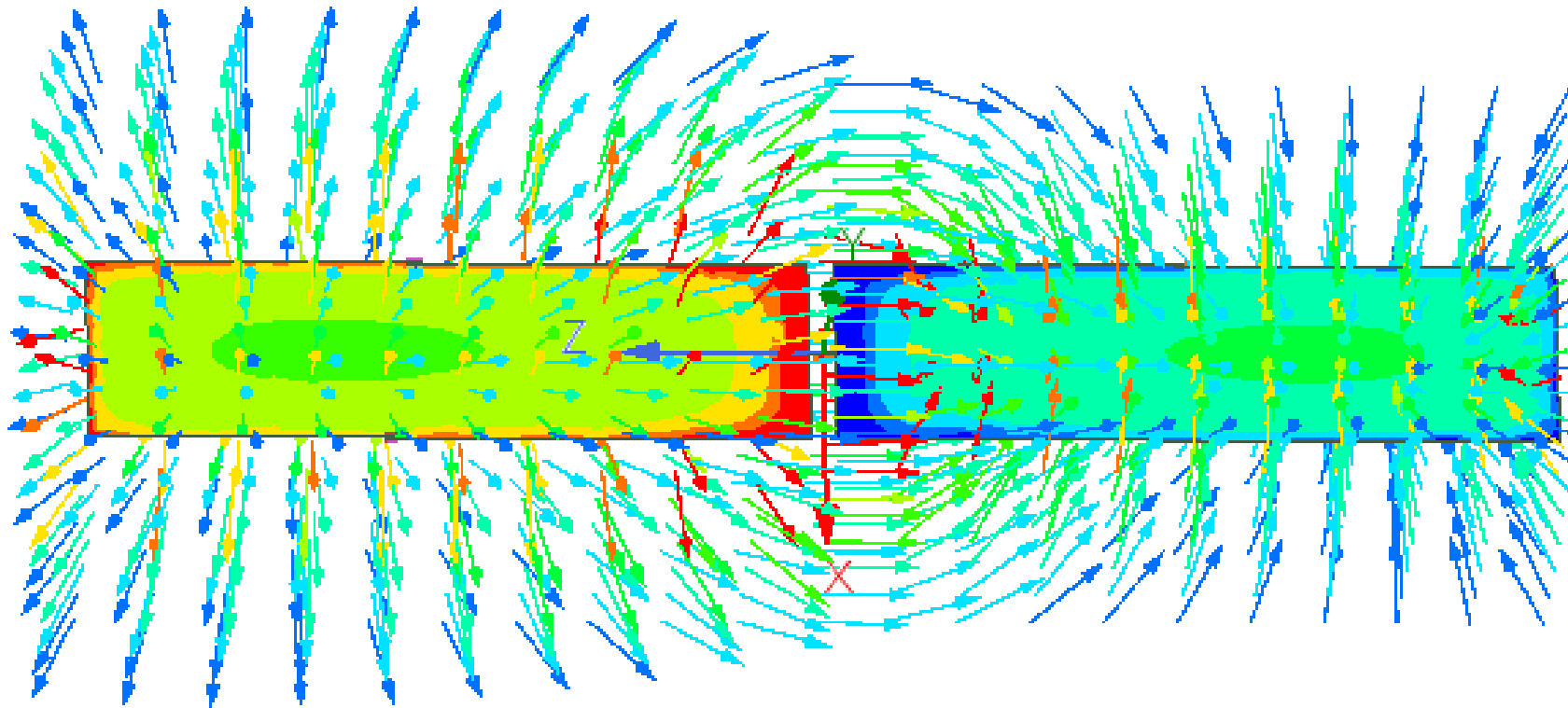
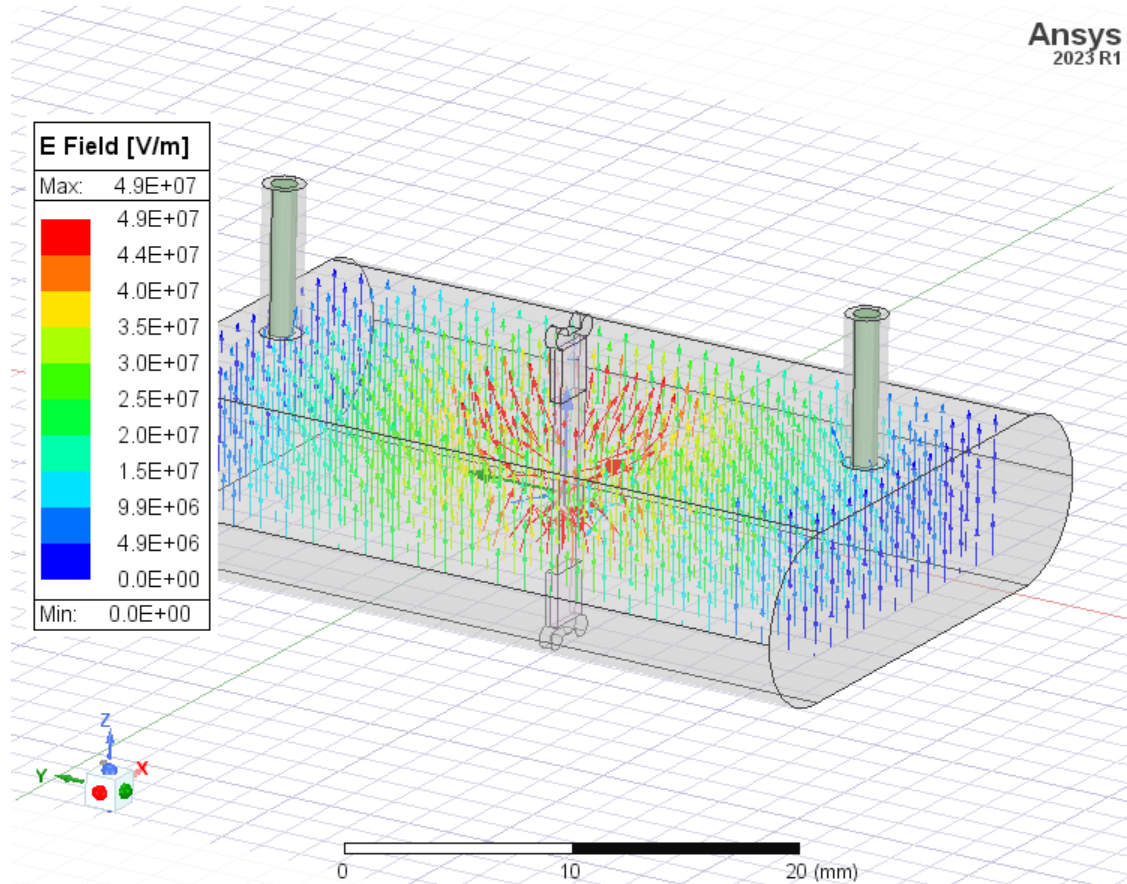


Ansys Hfss - Recipe

For the calculation of the effective distance d_{eff} of a dipole antenna





Setup:

- RF cavity dimensions: 26x36x8 mm (vacuum)
- Silicon substrate (silicon)
- QuBit
 - 2x 3D Superconducting pads
0.15mm x 100nm x 0.556mm (perfect conductor)
 - (2D Pads with boundary condition: Perfect E work the same)
 - JJ in between (vacuum)
 - Modeld with Lumped RLC boundary condition
L = 10 nH (also added C = 0.8 fF, only minor difference)

Settings:

- Solution Type: Eigenmode
- Field Source: Mode 1 TE₁₀₁

Fields Calculator

Effective distance:

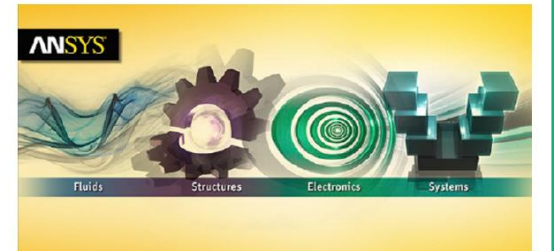
Surface charge densities
SmoothQ at phase = 0

$$d_{eff} = \iint_{pad_1} \frac{\rho_1(\vec{r})}{|Q|} z d\vec{r} + \iint_{pad_2} \frac{\rho_2(\vec{r})}{|Q|} z d\vec{r}$$

Charge on each pad $Q=Q_1=-Q_2$

The screenshot displays the 'Fields Calculator' window in Ansys HFSS. The 'Named Expressions' list includes variables like Mag_E, Mag_H, Mag_Jvol, Mag_Isurf, and Max_In. The context is set to 'Cavity_QuBit_beta_Pads'. Below the list are buttons for 'Add...', 'Copy to stack', 'Delete', 'Delete All', 'Load From...', 'Save To...', and 'Change Variable Values...'. The main area contains several lines of script code for calculating field magnitudes. At the bottom, there is a grid of mathematical operators categorized by 'Input', 'General', 'Scalar', 'Vector', and 'Output'. To the right of the calculator is a 3D visualization of the cavity structure with a color-coded field distribution and a coordinate system (X, Y, Z).

Introduction with examples how
to use the Fields Calculator



HFSS Fields Calculator Cookbook

Recipe to calculate d_{eff} with the Fields Calculator

Calculator Operation	Resulting Stack Display
Namend Expressions>SmoothQ(Copy to Stack)	Sc1 : SmoothQ
Namend Expressions>SmoothQ(Copy to Stack)	Sc1 : SmoothQ Sc1 : SmoothQ
Geometry...>Surface>pad_bottom	Sc1Srf : SurfaceValue(Surface(pad_bottom_3D), SmoothQ) Sc1 : SmoothQ
∫	Sc1 : Integrate(Surface(pad_bottom_3D), SmoothQ) Sc1: SmoothQ
Abs	Sc1 : Abs(Integrate(Surface(pad_bottom_3D), SmoothQ)) Sc1: SmoothQ
/	Sc1 : /(SmoothQ, Abs(Integrate(Surface(pad_bottom_3D), SmoothQ)))
Function...(>Scalar)>Z	Sc1 : Z*
*	Sc1 : *(/(SmoothQ, Abs(Integrate(Surface(pad_bottom_3D), SmoothQ))), Z)
Geometry...>Surface>pad_bottom	Srf : Surface(pad_bottom_3D) Sc1 : *(/(SmoothQ, Abs(Integrate(Surface(pad_bottom_3D), SmoothQ))), Z)
∫	Sc1 : Integrate(Surface(pad_bottom_3D), *(/(SmoothQ, Abs(Integrate(Surface(pad_bottom_3D), SmoothQ))), Z))
Eval	Sc1 : (value for deff in m)

* Z is the position in the Global CS! So the junction has to sit at (X,Y,0)