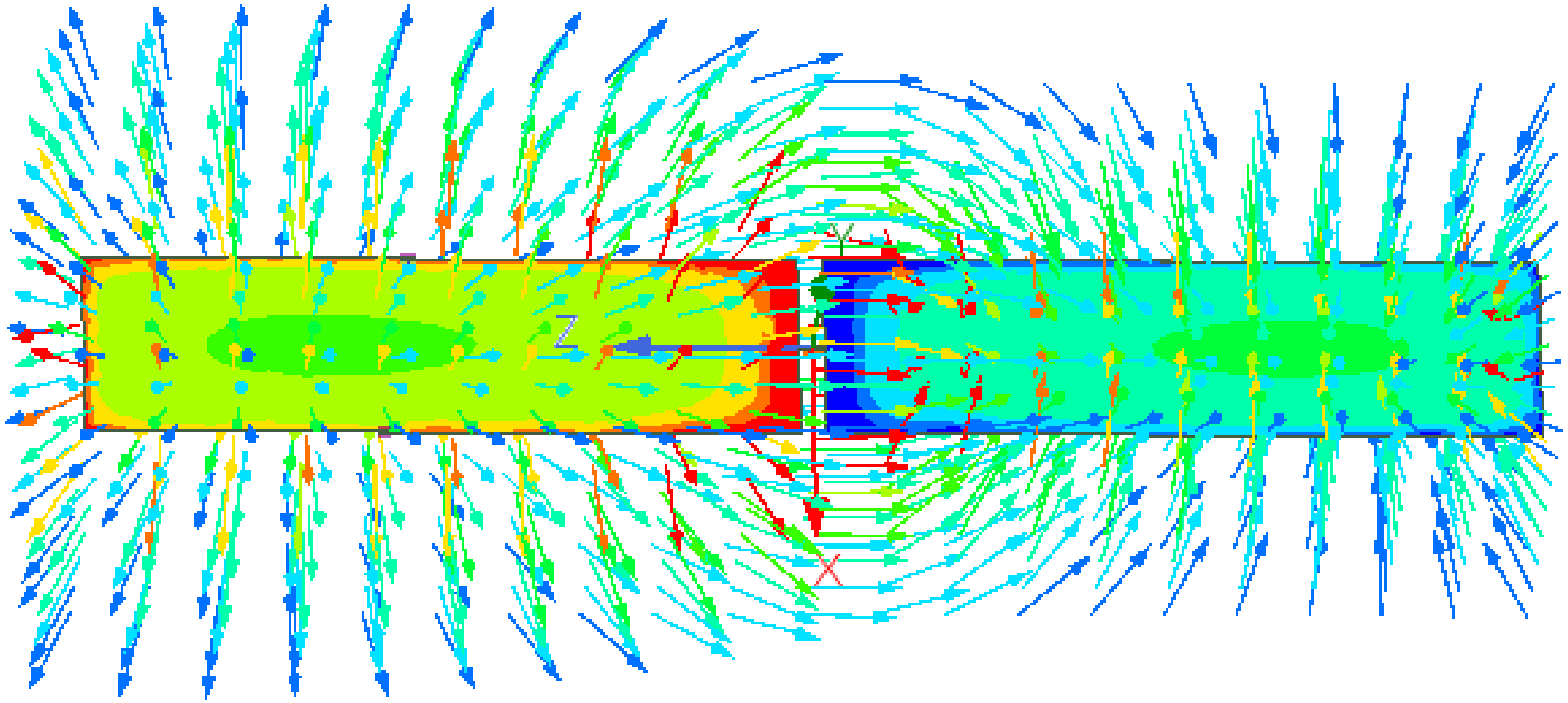
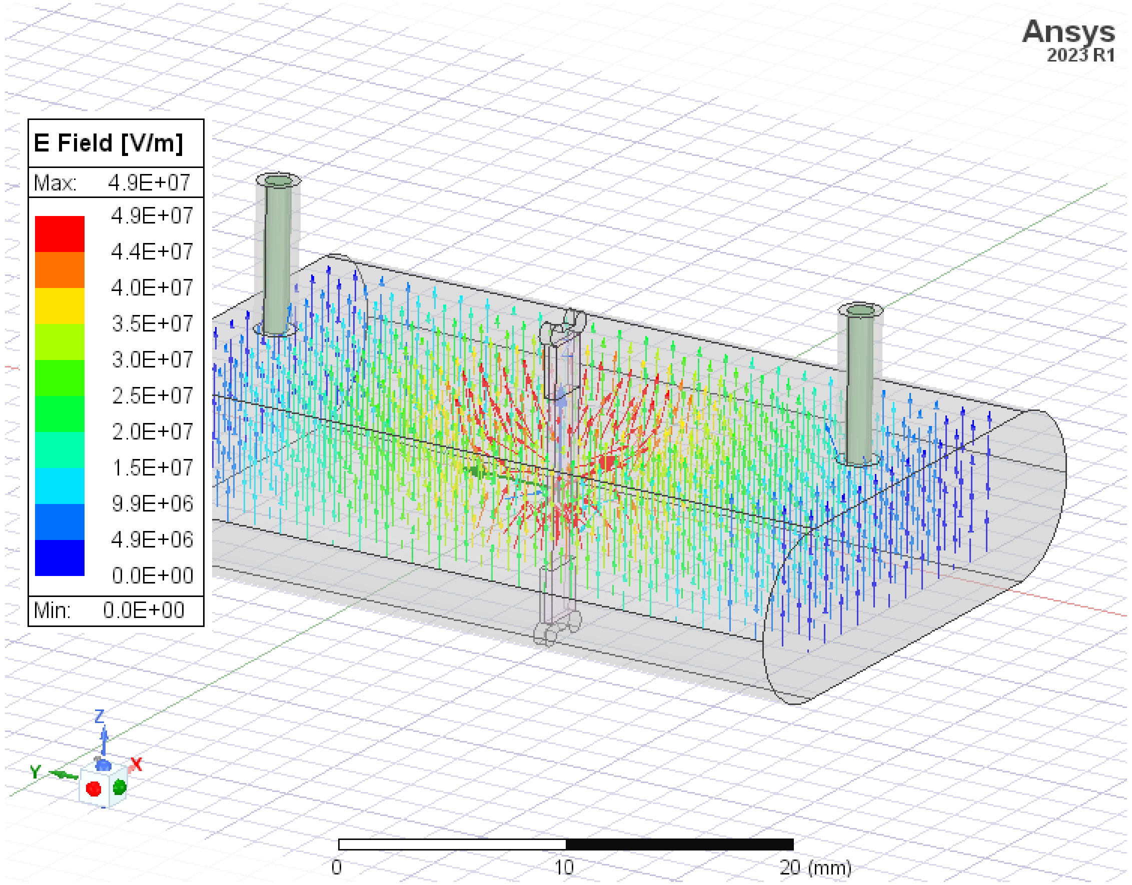
Ansys Hfss - Recipe

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 TE_{101}

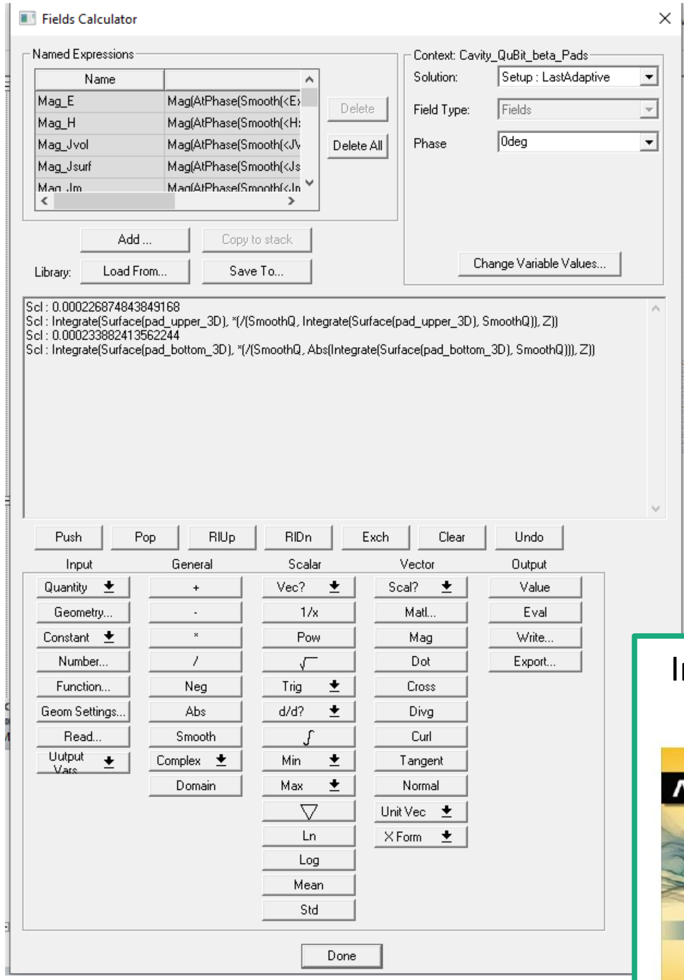
Fields Calculator

Effective distance:

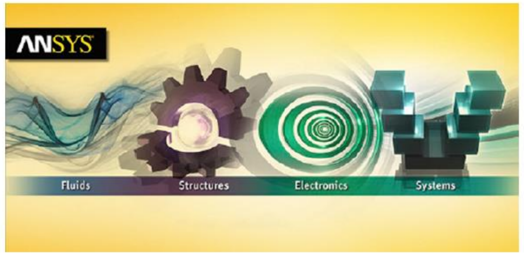
Surface charge densities
SmoothQ at phase = 0

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

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



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)	Scl : SmoothQ
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Geometry…>Surface>pad_bottom	SclSrf : SurfaceValue(Surface(pad_bottom_3D), SmoothQ) Scl : SmoothQ
∫	Scl : Integrate(Surface(pad_bottom_3D), SmoothQ) Scl: SmoothQ
Abs	Scl : Abs(Integrate(Surface(pad_bottom_3D), SmoothQ)) Scl: SmoothQ
/	Scl : /(SmoothQ, Abs(Integrate(Surface(pad_bottom_3D), SmoothQ)))
Function…(>Scalar)>Z	Scl : Z* Scl : /(SmoothQ, Abs(Integrate(Surface(pad_bottom_3D), SmoothQ)))
*	Scl : *(/(SmoothQ, Abs(Integrate(Surface(pad_bottom_3D), SmoothQ))), Z)
Geometry…>Surface>pad_bottom	Srf : Surface(pad_bottom_3D) Scl : *(/(SmoothQ, Abs(Integrate(Surface(pad_bottom_3D), SmoothQ))), Z)
∫	Scl : Integrate(Surface(pad_bottom_3D), *(/(SmoothQ, Abs(Integrate (Surface(pad_bottom_3D), SmoothQ))), Z))
Eval	Scl : (value for deff in m)

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