

Figure 3: S_r and S_z components of the principal part of the singularity $\mathbf{S}$.

Subsection 5.2. Below are depicted (see Figure 3) the non-vanishing components of the principal part of the singularity $\mathbf{S}$ introduced in (27).

We then compute the singular basis $\mathbf{y}_S^1$ and $\mathbf{y}_{\bar{S}}^1$ for $k = 1$ and for $k = -1$. In Figures 4 and 5, we depicted their real part (remember that they are complex quantities, as soon as $k \neq 0$) obtained by solving the variational formulation (28), with a standard P_1 finite element method. As one can see, the method is able to capture the singular behavior of the solution near the reentrant corner of ω (edge in Ω), whereas a conforming finite element method can not yield such a result.

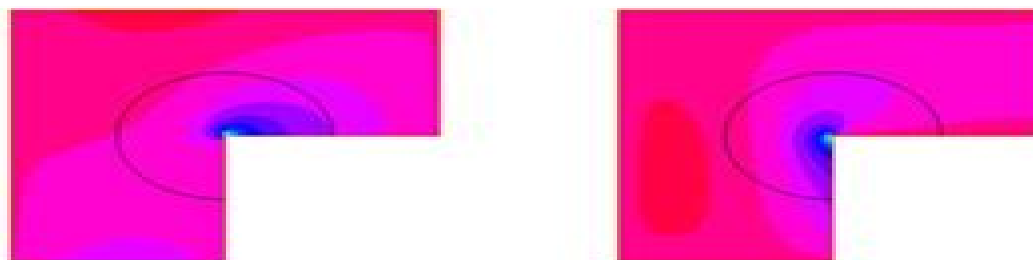


Figure 4: Real part $\Re(y_{S_r}^1)$ and $\Re(y_{S_z}^1)$ of the singular basis for $k = 1$, r and z components.

6.1.2 Mode $k = \pm 2$

For the sake of completeness, we present below the results obtained for $k = 2$, see Figure 6. As explained above, there is no need in our numerical strategy to compute modes for $|k| \geq 2$, since the modes corresponding to $|k| = 2$ appear as fundamental modes for $|k| > 2$. In other words, they can be used to compute the solution for all $|k| \geq 2$, despite the loss of orthogonality. This point will be illustrated in the next subsection. The numerical method is exactly the same as for $k = \pm 1$, and practically, we have only to change the parameter k in the formulation.

Approximations And Numerical Methods For The Solution Of Maxwells Equations

Peipei Pang



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