Different Imaging Functions and their Numerical Tests

$$I_1(z) = \mathrm{Im} \sum_{q=e_1,e_2} \int_{\Gamma_0^d} \int_{\Gamma_0^d} [\mathbb{T}_D(x_s,z)^T q] \cdot [\mathbb{T}_D(x_r,z)^T \overline{u_q^s(x_r,x_s)}]\, ds(x_r) ds(x_s).$$

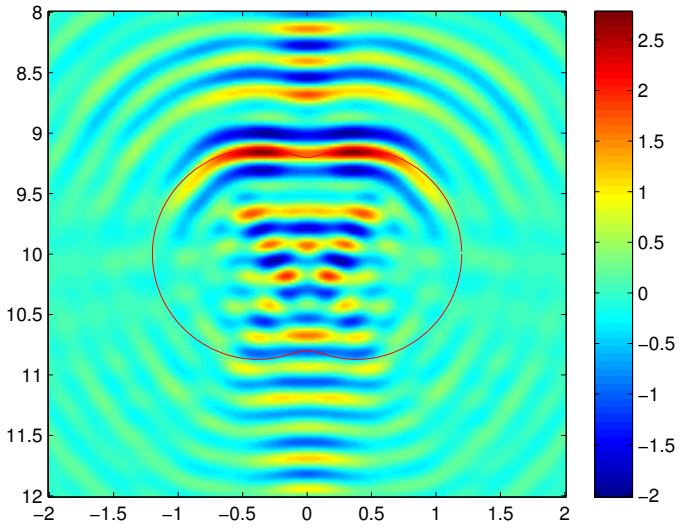

Figure 1. I_1

$$I_2(z) = \mathrm{Im} \int_{\Gamma_0^d} \int_{\Gamma_0^d} \mathbf{i}[\frac{\partial \Phi^s(x_s,z)}{\partial x_2(x_s)}] \nabla_z \times [\mathbb{T}_D(x_r,z)^T \overline{u_{e_2}^s(x_r,x_s)}]\, ds(x_r) ds(x_s).$$

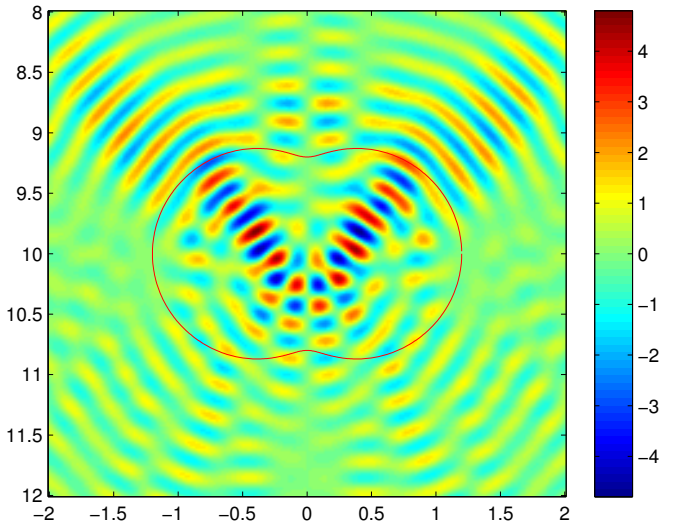

Figure 2. I_2

$$I_3(z) = \mathrm{Im} \int_{\Gamma_0^d} \int_{\Gamma_0^d} \mathbf{i}[\frac{\partial \Phi^p(x_s, z)}{\partial x_2(x_s)}] \nabla_z \times [\mathbb{T}_D(x_r, z)^T \overline{u^s_{e_2}(x_r, x_s)}]\, ds(x_r) ds(x_s).$$

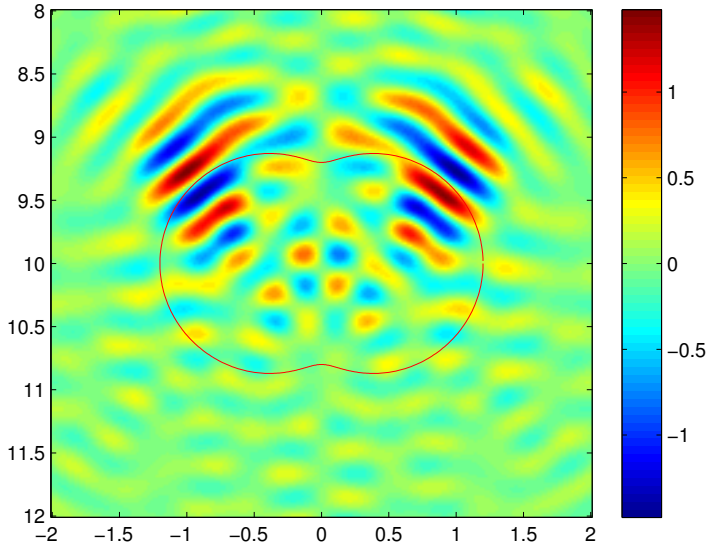

Figure 3. I_3

$$I_4(z) = \mathrm{Im} \int_{\Gamma_0^d} \int_{\Gamma_0^d} \mathbf{i}[\frac{\partial \Phi^s(x_s, z)}{\partial x_2(x_s)}] \nabla_z \cdot [\mathbb{T}_D(x_r, z)^T \overline{u^s_{e_2}(x_r, x_s)}]\, ds(x_r) ds(x_s).$$

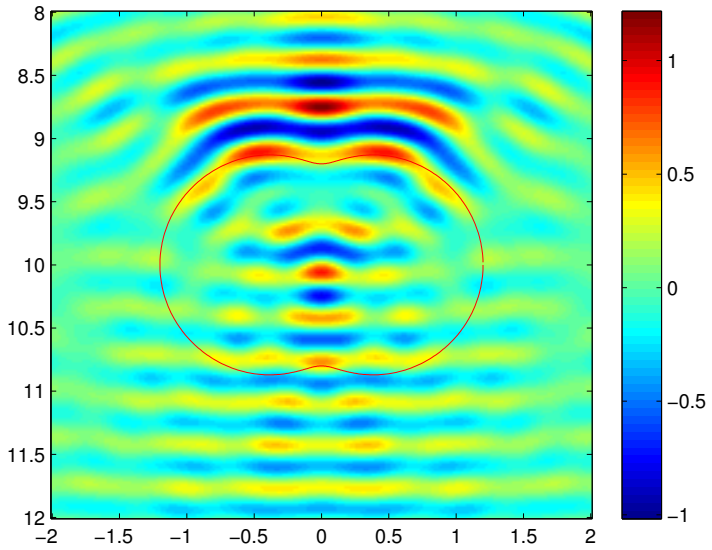

Figure 4. I_4

$$I_5(z) = \mathrm{Im} \int_{\Gamma_0^d} \int_{\Gamma_0^d} \mathbf{i}[\frac{\partial \Phi^p(x_s, z)}{\partial x_2(x_s)}] \nabla_z \cdot [\mathbb{T}_D(x_r, z)^T \overline{u^s_{e_2}(x_r, x_s)}]\, ds(x_r) ds(x_s).$$

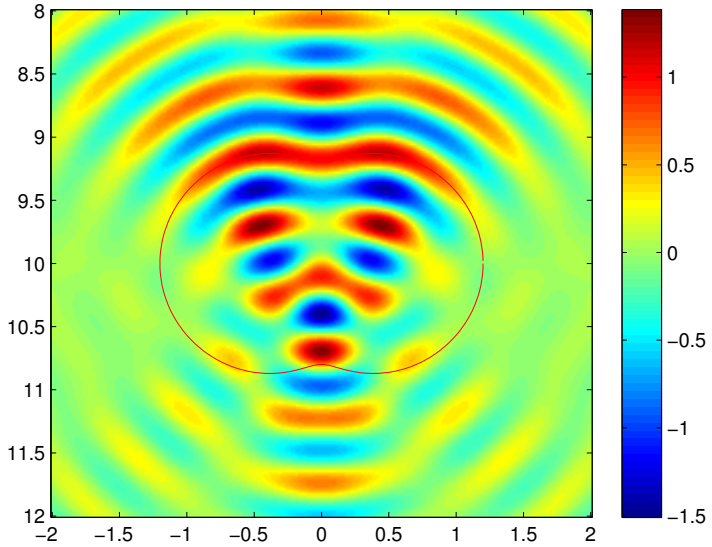

Figure 5. I_5

$$I_6(z) = \mathrm{Im} \int_{\Gamma_0^d} \int_{\Gamma_0^d} \mathbf{i}[\frac{\partial \Phi^s(x_s, z)}{\partial x_2(x_s)}] \nabla_z \times [\mathbb{T}_D(x_r, z)^T \overline{u^s_{e_1}(x_r, x_s)}]\, ds(x_r) ds(x_s).$$

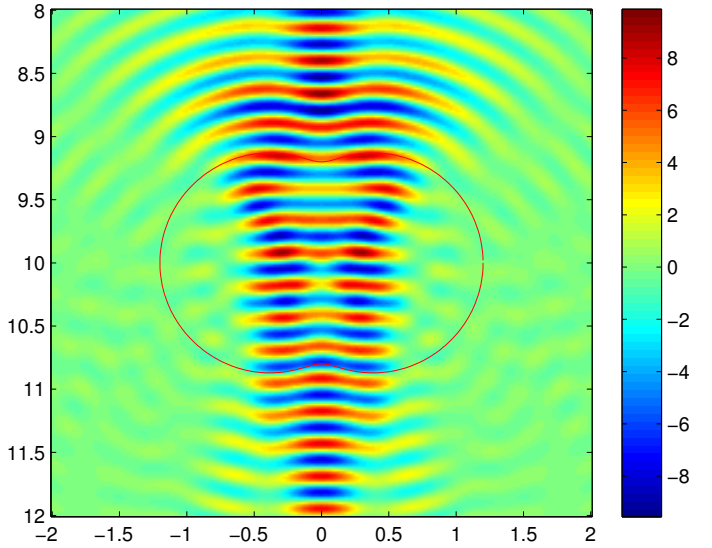

Figure 6. I_6

$$I_7(z) = \mathrm{Im} \int_{\Gamma_0^d} \int_{\Gamma_0^d} \mathbf{i}[\frac{\partial \Phi^s(x_s, z)}{\partial x_2(x_s)}] \nabla_z \times [\mathbb{T}_D(x_r, z)^T \overline{u^s_{e_1}(x_r, x_s)}]\, ds(x_r) ds(x_s).$$

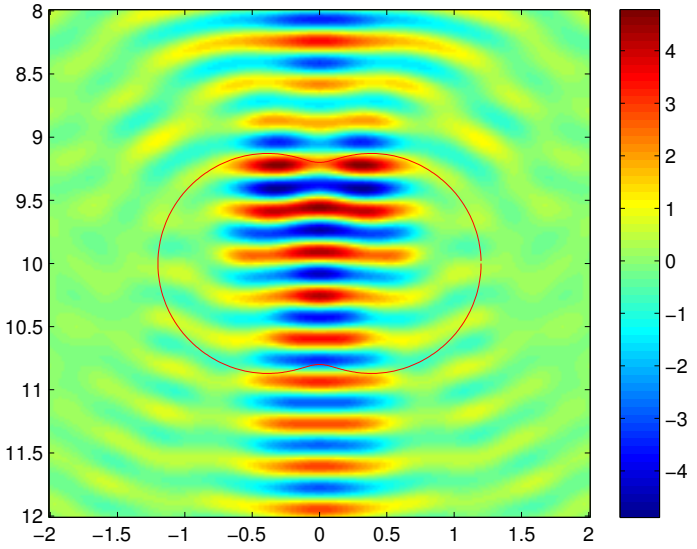

Figure 7. I_7

$$I_8(z) = \mathrm{Im} \int_{\Gamma_0^d} \int_{\Gamma_0^d} \mathbf{i}[\frac{\partial \Phi^s(x_s, z)}{\partial x_2(x_s)} + \frac{\partial \Phi^p(x_s, z)}{\partial x_2(x_s)}] \nabla_z \cdot [\mathbb{T}_D(x_r, z)^T \overline{u^s_{e_2}(x_r, x_s)}]\, ds(x_r) ds(x_s).$$

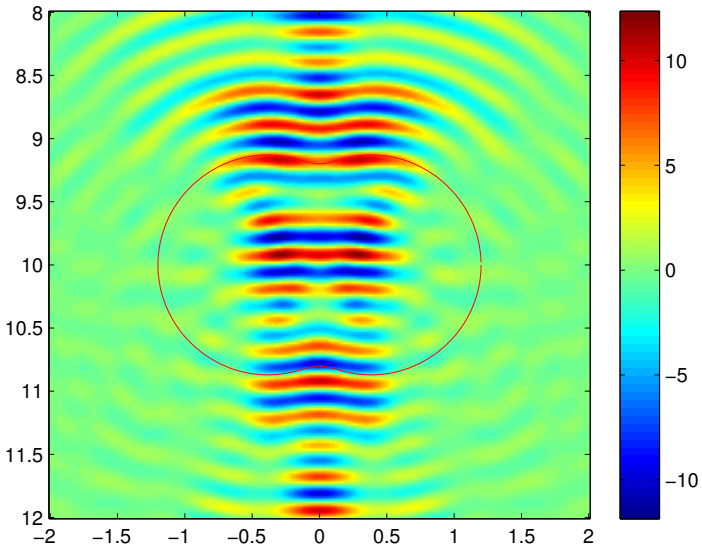

Figure 8. I_8

$$I_9(z) = \mathrm{Im} \int_{\Gamma_0^d} \int_{\Gamma_0^d} \mathbf{i}[\frac{\partial \Phi^s(x_s,z)}{\partial x_2(x_s)} + \frac{\partial \Phi^p(x_s,z)}{\partial x_2(x_s)}]\nabla_z \times [\mathbb{T}_D(x_r,z)^T \overline{u^s_{e_1}(x_r,x_s)}]\, ds(x_r) ds(x_s).$$

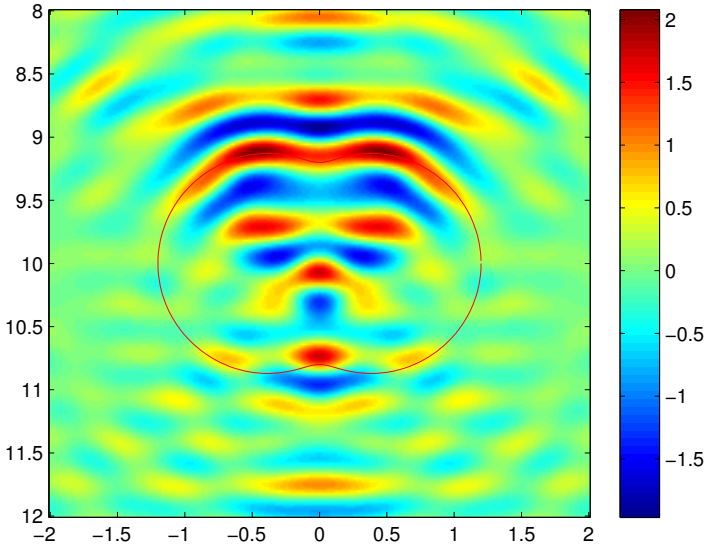

Figure 9. I_9

$$I_{10}(z) = \frac{c_s}{k_s} I_8(z) + \frac{c_p}{k_p} I_9(z)$$

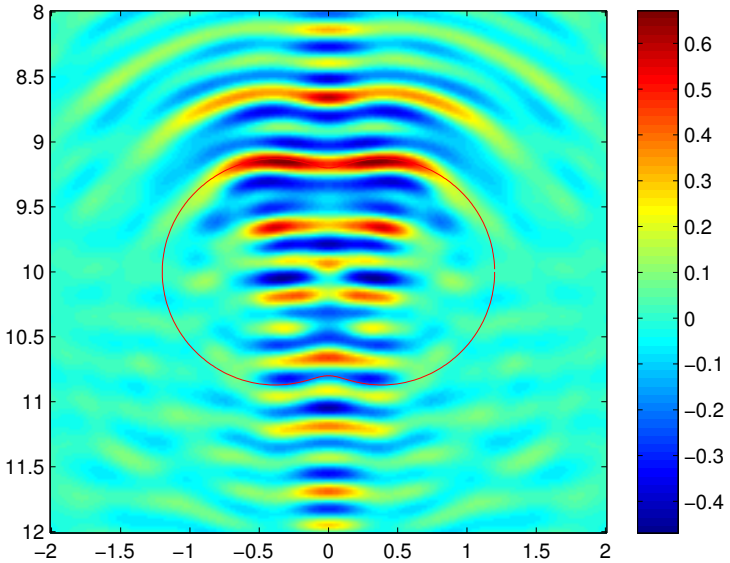

Figure 10. I_{10}

$$I_{11}(z) = \mathrm{Im} \int_{\Gamma_0^d} \int_{\Gamma_0^d} \frac{\partial \Phi^p(x_s, z)}{\partial x_2(x_s)} \frac{\partial \Phi^p(x_r, z)}{\partial x_2(x_r)} [\overline{u^s_{e_2}(x_r, x_s)} \cdot e_2] \, ds(x_r) ds(x_s).$$

$$I_{12}(z) = \mathrm{Im} \int_{\Gamma_0^d} \int_{\Gamma_0^d} \frac{\partial \Phi^s(x_s, z)}{\partial x_2(x_s)} \frac{\partial \Phi^s(x_r, z)}{\partial x_2(x_r)} [\overline{u^s_{e_1}(x_r, x_s)} \cdot e_1] \, ds(x_r) ds(x_s).$$

$$I_{13}(z) = \mathrm{Im} \int_{\Gamma_0^d} \int_{\Gamma_0^d} [\frac{\partial \Phi^p(x_s, z)}{\partial x_2(x_s)} + \frac{\partial \Phi^s(x_s, z)}{\partial x_2(x_s)}][\frac{\partial \Phi^p(x_r, z)}{\partial x_2(x_r)} + \frac{\partial \Phi^s(x_r, z)}{\partial x_2(x_r)}][\overline{u^s_{e_2}(x_r, x_s)} \cdot e_2] \, ds(x_r) ds(x_s).$$

$$I_{14}(z) = \mathrm{Im} \int_{\Gamma_0^d} \int_{\Gamma_0^d} [\frac{\partial \Phi^p(x_s, z)}{\partial x_2(x_s)} + \frac{\partial \Phi^s(x_s, z)}{\partial x_2(x_s)}][\frac{\partial \Phi^p(x_r, z)}{\partial x_2(x_r)} + \frac{\partial \Phi^s(x_r, z)}{\partial x_2(x_r)}][\overline{u^s_{e_1}(x_r, x_s)} \cdot e_1] \, ds(x_r) ds(x_s).$$