Classical transverse resistive wall Impedance and Wakefunction:

$$Z_{m=1}^{\perp}(\omega) = (1 - i\,\mathrm{sgn}\,\omega)\,\frac{cL}{\pi b^3}\,\sqrt{\frac{\mu_o\mu_r}{2\,\sigma}} \cdot \frac{\sqrt{|\omega|}}{\omega}$$

$$= (1 - i)\,\frac{cL}{\pi b^3}\,\sqrt{\frac{\mu_o\mu_r}{2\,\sigma}} \cdot \frac{1}{\sqrt{\omega}}$$

$$W_{m=1}^{\perp}(t < 0) = -\frac{cL}{\pi^{3/2}b^3}\,\sqrt{\frac{\mu_o\mu_r}{\sigma}} \cdot \frac{1}{\sqrt{|t|}}$$

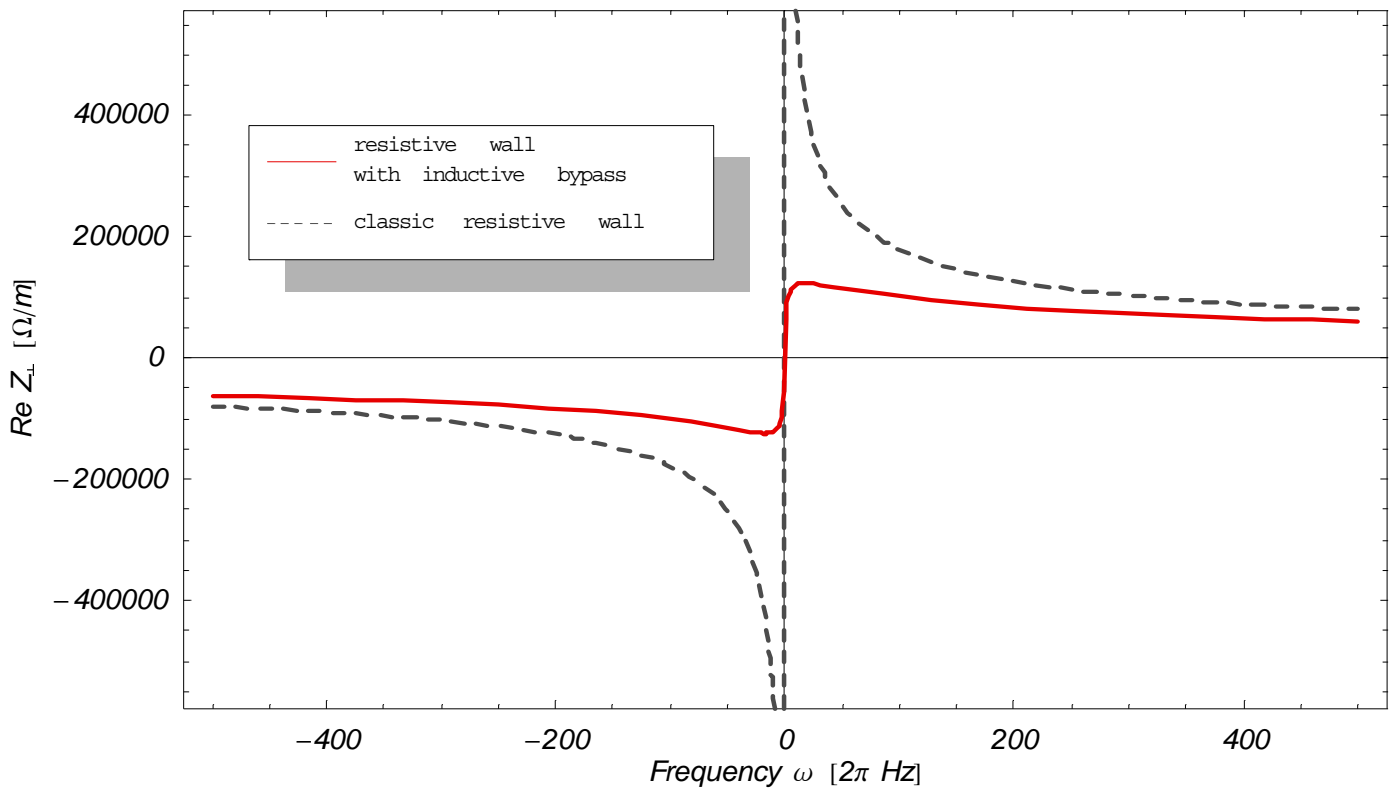Trans. res. wall Impedance and Wakefunction with inductive bypass:

$$Z_{m=1}^{\perp}(\omega) = \frac{Z_{\parallel} \cdot Z_{ind}}{Z_{\parallel} + Z_{ind}} \cdot \frac{2c}{b^2\omega}$$

$$Z_{m=1}^{\perp}(\omega) = (1 - i)\,\frac{cL}{\pi b^2}\,\frac{\mu_0}{(2 + 2\,i) + b\sqrt{\frac{2\sigma\mu_0}{\mu_r}} \cdot \sqrt{\omega}}$$

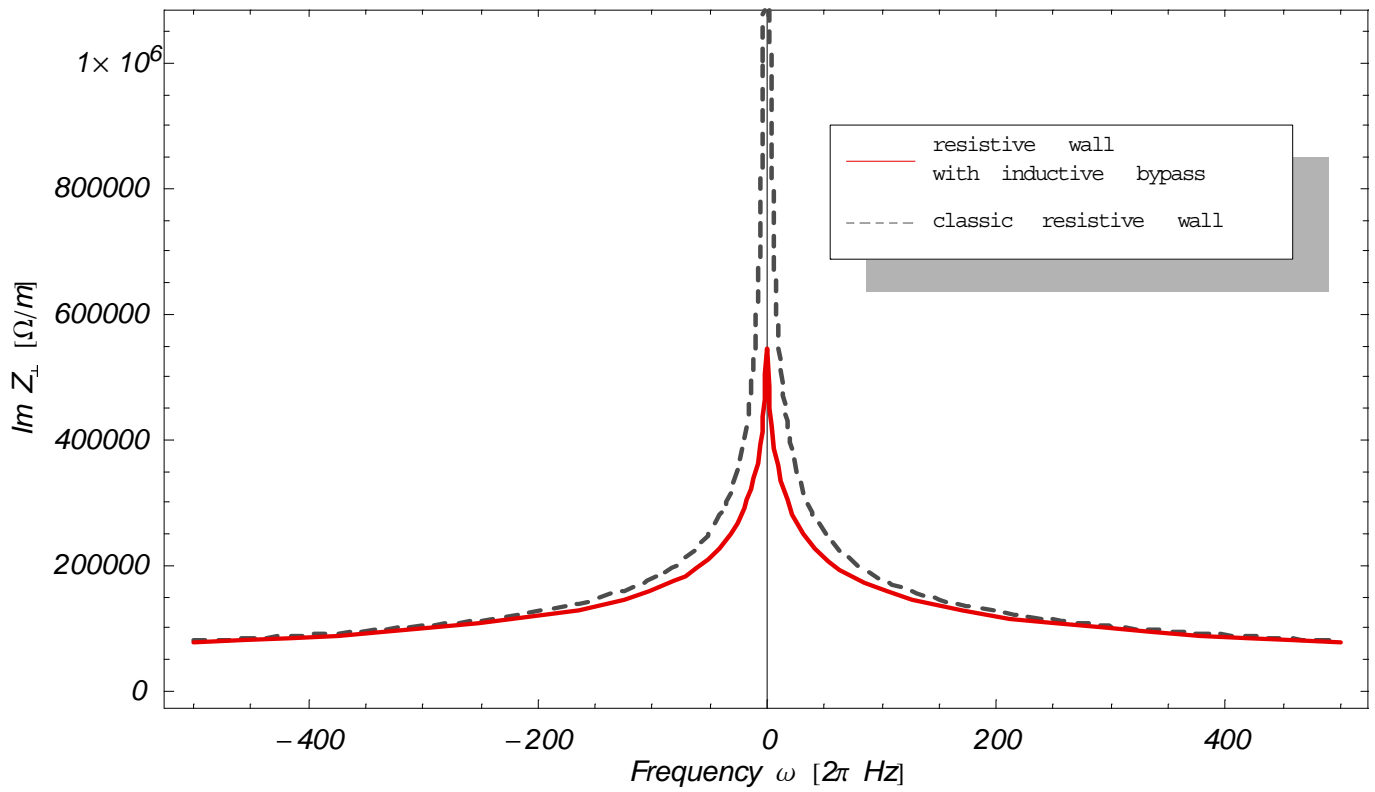$$Z_{\parallel} = (1 - i\,\mathrm{sgn}\,\omega)\,\frac{1}{\delta_{skin}\sigma}\,\frac{L}{2\pi b}$$

$$\delta_{skin} = \sqrt{\frac{2}{\sigma\mu_0\mu_r|\omega|}}$$

$$Z_{ind} = -i \cdot \frac{L\mu_0}{4\pi} \cdot \omega$$

$$W_{m=1}^{\perp}(t < 0) = -\frac{cL}{\pi^{3/2}b^3}\,\sqrt{\frac{\mu_o\mu_r}{\sigma}} \cdot \frac{1}{\sqrt{|t|}}$$

$$+ \exp\left[\frac{4\mu_r}{b^2\sigma\mu_0}\,|t|\right]\,\frac{2cL}{b^4\pi}\,\sqrt{\frac{\mu_r}{\sigma^2}}$$

$$- \exp\left[\frac{4\mu_r}{b^2\sigma\mu_0}\,|t|\right]\,\frac{2cL}{b^4\pi}\,\sqrt{\frac{\mu_r^2}{\sigma^2}} \cdot \mathrm{erf}\sqrt{\frac{4\mu_r}{\sigma\mu_0 b^2}\,|t|}$$

$$= [\text{with } \mu_r \approx 1] =$$

$$= -\frac{cL}{\pi^{3/2}b^3}\,\sqrt{\frac{\mu_o\mu_r}{\sigma}} \cdot \frac{1}{\sqrt{|t|}}$$

$$+ \exp\left[\frac{4\mu_r}{b^2\sigma\mu_0}\,|t|\right]\,\frac{2cL}{b^4\pi}\,\sqrt{\frac{\mu_r}{\sigma^2}} \cdot \mathrm{erfc}\sqrt{\frac{4\mu_r}{\sigma\mu_0 b^2}\,|t|}$$
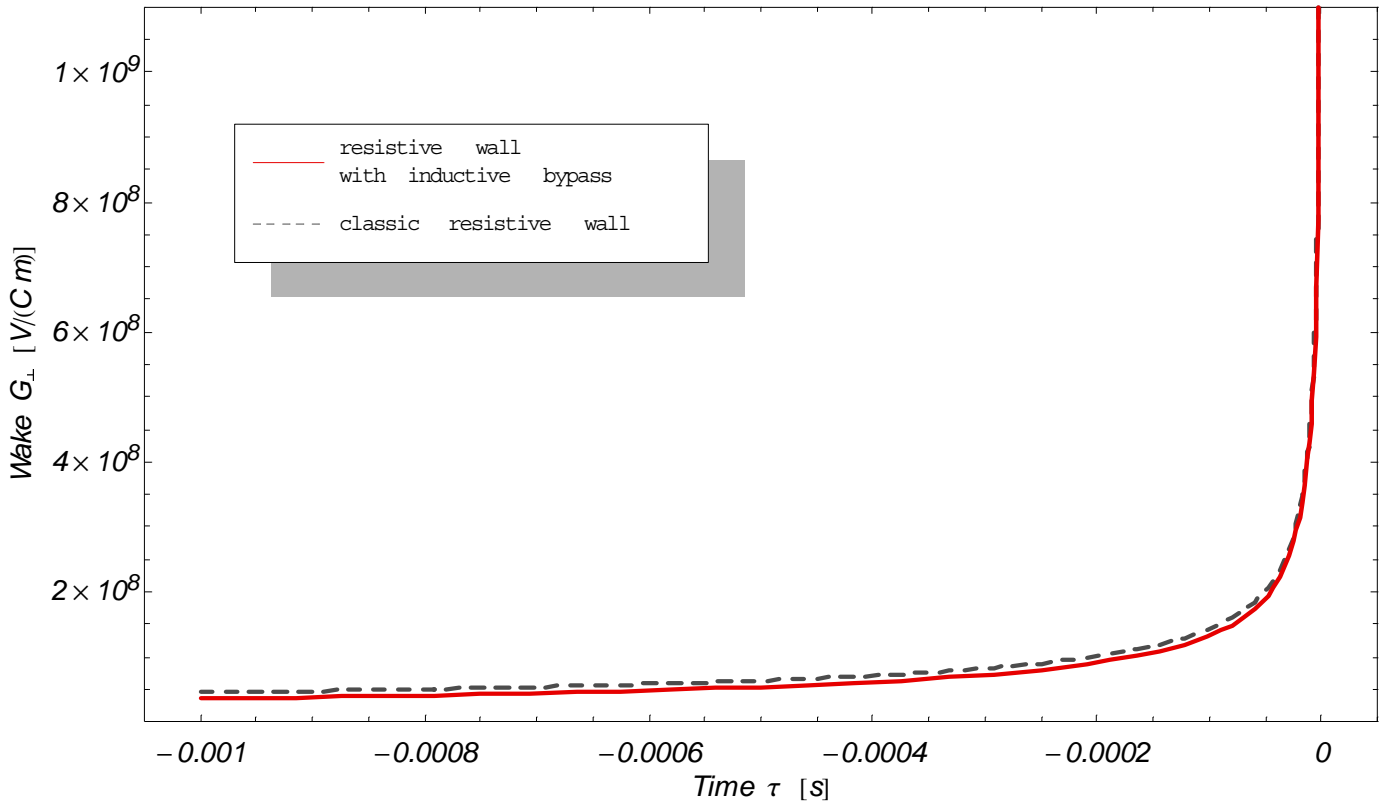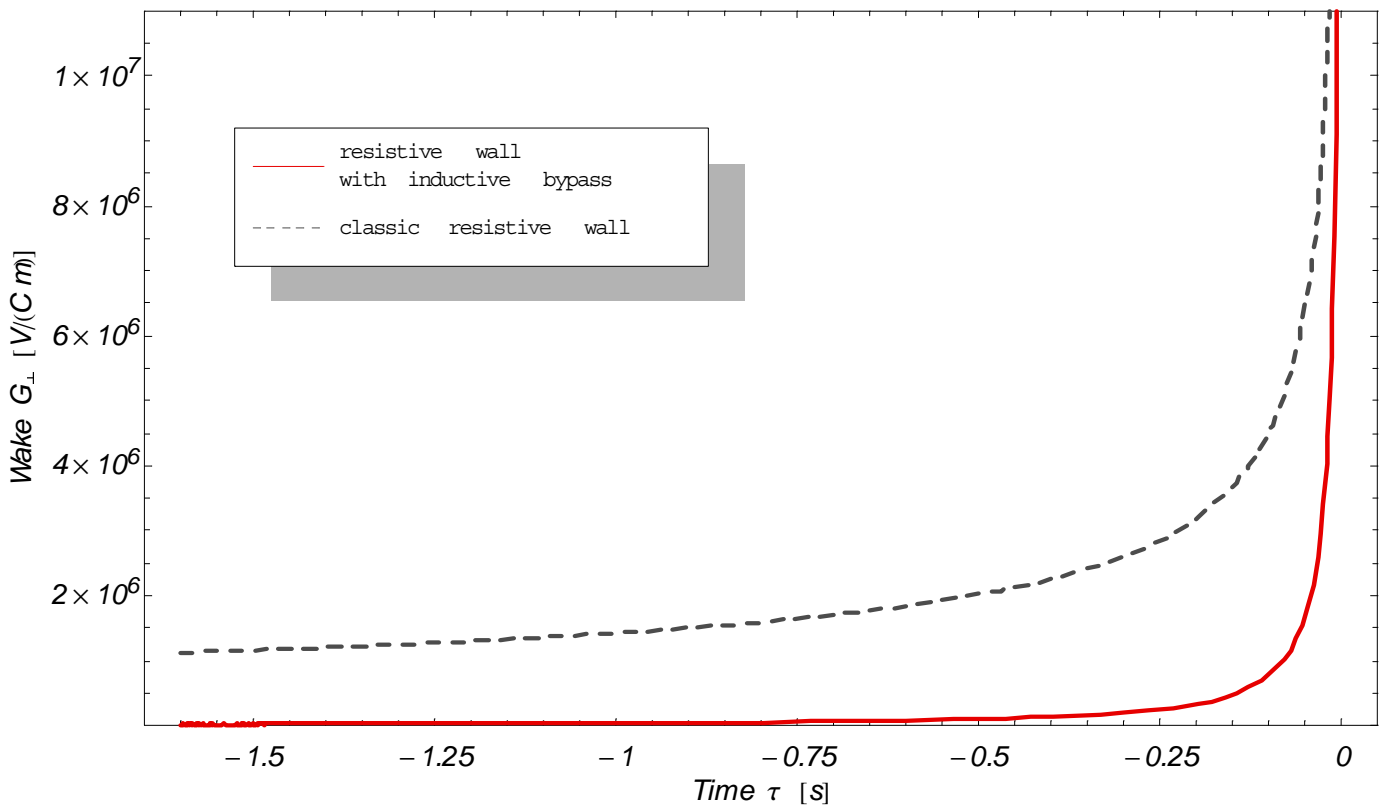
Transverse Resistive Wall Impedance $Z_\perp(\omega)$

Transverse Resistive Wall Impedance $Z_\perp(\omega)$

Transverse Resistive Wall Wake Function $G_\perp(\tau)$

Legend:
— resistive wall with inductive bypass
-- classic resistive wall

Transverse Resistive Wall Wake Function $G_\perp(\tau)$

Legend:
— resistive wall with inductive bypass
-- classic resistive wall

Logarithmic Transverse Resistive Wall Wake Function $\text{Log } G_\perp(\text{Log } \tau)$

Turns

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