Figure S7 | Normalized residual diagnostics: frequency structure, distribution shape, and normality checks. (a)-(b) Frequency-resolved normalized residuals for the real and imaginary components, $\tilde{r}^{\Re}(\omega) = \Re\left(Z_{fit} - Z_{data}\right)/|Z(\omega)|$ and $\tilde{r}^{\Im}(\omega) = \Im\left(Z_{fit} - Z_{data}\right)/|Z(\omega)|$, plotted versus frequency to identify where the model mismatch is concentrated after removing the scale variation of $|Z(\omega)|$. (c)-(d) Histograms of $\tilde{r}^{\Re}(\omega)$ and $\tilde{r}^{\Im}(\omega)$ summarizing the overall residual distributions across the full spectrum; asymmetry or heavy tails indicate departures from simple i.i.d. Gaussian error. (e)-(f) Q–Q plots of the normalized residuals against standard normal quantiles ($\Re e$ and $\Im m$ separately), providing a compact normality diagnostic: near-linear alignment indicates approximately Gaussian residuals, while curvature and tail deviations reflect heteroscedasticity and/or structured model mismatch remaining in specific frequency regimes.